GSJ: Volume 10, Issue 10, October 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

Re-examining Project Management as a Two-Dimensional Construct: An Empirical Study

Daketima G. Briggs, Ph.D., PMP, CDEP

Botswana Open University

ABSTRACT

Project management is viewed, described, taught, and learned differently by various practitioners, institutions, academics, and learners alike. Different skill sets are utilized in project management practices at different phases of the project life cycle, leading to the completion of a project. Some of the activities require soft skills and others require hard skills. Because of this mix, it is well established in project management discourse that project management is both art and science. Nevertheless, there is no consensus as to whether project management is more science, more art, or is as much art as it is science. Further, there is stronger disagreement about what influences learners' perceptions of project management. Furthermore, the established views of project management are from the perspectives of western (developed) countries. That said, the purpose of this study was to ascertain whether learners' perceptions of project management are influenced by their learning orientation (i.e., program of study). An empirical study was conducted with graduate students of project management at two universities in a developing country. The results indicated that indeed, learners' perceptions of project management are influenced by their learning orientation. The results indicated that Faculty of Engineering and Technology learners view project management as more science while Faculty of Business and Management learners view project management as more art. Besides, learners do not think that project management is as much an art as it is a science. These differences are statistically significant at the $p < .05$ level.

KEYWORDS: project management; art; science; learning orientation; perceptions

INTRODUCTION

The notion of project management as both art and science is well established in project management literature. Project management is viewed differently by different learners, practitioners, institutions, and organizations. Some see it as science (Warburton & Kanabar, 2016; Sukhoo et al., 2005), others see it as art (Vinje & Burke, 2007; Tran, 2015), and still, others view it as a combination of both (Virine & Trumper, 2008; Larson & Gray, 2014).

Schaffer (2015) posits that dealing with team members is often an exercise in creative expression and describes the art of project management as the ability to anticipate chaos and

handle issues as they arise, often with no warning and no definite solution. On the other hand, she describes science as a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws. She maintains that this view is driven by logic, process, and facts. An extensive search of the literature revealed that the notion of project management as being an art and science was advanced primarily through reviews of the literature from Western perspectives. A study by the author confirms these views. Following that study, the current work builds on and extends the previous theoretical study by the author entitled "Reassessing Project Management: A Science or An Art?" (Briggs, 2012). The current study also examines the two-dimensional constructs highlighted above. However, this study empirically examines the constructs from a non-western perspective. Besides, additional questions that were largely ignored in previous studies were asked and answered. This widens assessments of the constructs mentioned above. Therefore, this study investigates an area that has been studied conceptually within a western context and published in the literature to an extent. However, this study is an empirical investigation with a different population within a non-western context and with a new set of questions that have largely been ignored in previous studies.

There is no universal definition of project management. This lack of a universal definition is highlighted by the different definitions advanced by different project management scholars, academics, practitioners, and associations alike. For example, Kerzner (2013) defines Project Management as the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. For the Project Management Institute (PMI), Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMBOK® Guide, 2017). PRINCE2™ (2009) on the other hand, defines Project Management as the planning, delegating, monitoring, and control of all aspects of the project, and the motivation of those involved, to achieve the project objectives within the expected performance targets for time, cost, quality, scope, benefits, and risk. Furthermore, the Association for Project Management (APM) defines Project Management as the process by which projects are defined, planned, monitored, controlled, and delivered such that the agreed benefits are realized (APMBOK™, 2006). And for Kloppenborg, Anantatmula, and Wells (2019), Project Management is the art and science of using knowledge, skills, tools, and techniques efficiently and effectively to meet stakeholder needs and expectations.

From the various preceding definitions, one can see that none of the three major project management professional associations explicitly used the words "art and science" in their definitions. Nevertheless, the concepts of art and science are implied in their definitions. It is

the definition of Kloppenborg, Anantatmula, and Wells that explicitly captures the two-dimensional constructs that constitute the focus of this study. Hence, this study is intended to examine project management as a two-dimensional constructs.

According to Jackline Fernandes (2014) of Whizlabs, whether project management is art or science, entirely depends on the type of organization a person is working in. She maintains that in case someone's PMO is doing the governance part only, the project management is used as more art than science in the ratio around 60:40. She also states that since project management does not bear absolute truth, it cannot completely be a science. From Fernandes thinking, some PMOs help in pushing the framework, others micromanage people, and still, others give employees the opportunity to interpret the actual deliverables (ibid). In the literature, there is more agreement than disagreement along this line of reasoning.

At its core, effective project management is an exercise in communication (Schaffer, 2015). In this respect, plans are established, stakeholders are identified, and progress is communicated. Similarly, Abbasi, Wajid, Iqbal, and Zafar (2014) noted that gaps in communication are one of five reasons why projects fail. However, some authors articulate a balanced view. For example, Larson and Gray (2014) argue that Projects require both technical and social applications for their success. Along this line, they contend that project management requires the development of distinct technical and management skills where the technical part of project management is scientific while the managerial part of project management is artistic.

Given the lack of consensus about whether project management is more art or more science and whether the perceptions of learners are influenced by their program of study, this study poses the following questions:

The Research Questions

RQ1. Is there a relationship between learners' program of study and their perception regarding the two-dimensional constructs of project management?

RQ2. Is project management as much art as it is science?

RQ3. Is there a statistically significant difference between the perceptions of learners from different project management programs of study towards the two constructs?

Aim of the study: Given the above background information, the research problem formulated, and the research questions posed, the purpose of this study is, therefore, to assess the perceptions of two groups of learners from two universities about project management to

establish whether their perceptions are influenced by their program of study. To accomplish this purpose, the study adopts a survey research design to assess the perceptions of the two groups of learners enrolled in graduate programs in project management at two universities. The institutions are in a non-western (developing) country.

In addition, the following hypotheses are formulated and tested against empirical evidence to ascertain the statistical significance between the differences in the two groups of respondents' perceptions. This is intended to serve as a confirmatory measure.

Hypotheses – It is hypothesized that:

H_1: There is no relationship between learners' program of study and their perception of the two-dimensional constructs of project management.

H_2: Project management is as much art as it is science.

H_3: There is no statistically significant difference in perceptions towards project management between learners enrolled in different project management programs of study.

The above hypotheses are the null hypotheses. The alternative hypotheses (not explicitly Stated here) which are also referred to as the research hypotheses are the opposite of the null. It should be noted that all the alternative hypotheses are non-directional, thus necessitating a two-tailed distribution.

It has been observed that there are two foremost contrasts between art and science. The first is that art is subjective (abstract) while science is objective (concrete). The second is that art communicates information, frequently as abstract portrayal, while science is the arrangement of obtaining learning. Barnes (APM president 2003-2012) professes that, at its most fundamental, project management is about people getting things done. Following practices in APM's body of knowledge, project management is explained as the application of processes, methods, skills, knowledge, and experience to achieve specific project objectives according to the project acceptance criteria within agreed parameters (APM, 2012). Project management produces final deliverables which are time- and budget-constrained. It can either be art or science depending on the context, skills, methods, and techniques needed and applied (Fernandes, 2014; Larson & Gray, 2014). Some project managers help in pushing the framework, some micromanage/supervise people, and others give their team members the opportunity to interpret the deliverables (op.cit.).

Significance of the study: The results of this study have both practical and scholarly implications. Practically, the recommendations will enable librarians to determine the section

(e.g., Science, Engineering, Computer Information Technology, hybrid, or Business and Management) to house project management resources. The results will enable institutions to determine the most appropriate faculty/school within the institution to house project management programs. Scholarly, Students will have a better sense of why different authors, scholars, and schools refer to project management differently. The inconsistencies in reference to project management, cause confusion when potential students are making decisions about the project management program of study to enroll in. The level of confusion will decrease when students know whether the project management program offered at a given institution has a science orientation, technology orientation, engineering orientation, balanced orientation, or business and management orientation. Such appreciation will enable students to enroll in a program of study that is more in line with their background, interests, and career aspiration. In a way, this is a further addition of the author's voice to the ongoing debate about project management. This, in turn, contributes to the growing body of literature on the topic.

Structure of the Study

This paper is divided into five sections. The first section introduces the study and places the research in context. The second section critically reviews the literature on the topic. In that section, the inconsistencies and contradictions are identified, agreements and support are pointed out, findings/results are validated in relation to the current empirical study, and the voice of the author is added to the ongoing debate on the issue. The third section deals with the issue of research methodology. There, the research strategy adopted; the sampling techniques, data collection methods, and data analysis techniques used are discussed. The fourth section discusses the results of the empirical study. There, the results from the empirical study are linked to the problem statement, research questions, hypotheses formulated, purpose of the study, and the literature. Finally, in the fifth section, the loose ends in the various sections of the study are tied together; conclusions are drawn from the study, and recommendations for practice are provided.

LITERATURE REVIEW

This section reviews other sources that have discussed the topic of whether project management is an art or a science, more art or more science, and both art and science. Here, inconsistencies and contradictions are identified; agreements and supports are highlighted;

findings/results are validated considering various views on the topic, and the voice of the author is added to the ongoing debate on the issue. To accomplish these, this section provides a critical review and evaluation of the literature; given the research problem, research questions, and the hypotheses which motivate this study, and connections are made.

Kerzner (2013) posits that effective project management involves much more than the application of the scientific processes, tools, and techniques but [involves] the use of soft skills to successfully implement projects. Sukhoo et al. (2005) echo Kerzner's observation in a different way, stating that soft skills as often described as art is concerned with working and managing people, ensuring customer satisfaction, and creating a conducive environment for the project team to deliver quality projects within budget, on time, and exceeding stakeholder expectations. Kerzner (2013) further argued that project failure was related to over-emphasis in project management on formal tools and techniques. This contradicts Feranades (2014) observation that if PMOs focus only on the governance aspects of project management, then the project management in that environment is focused on the artistic component in the ratio of 60:40 percent. Similarly, in a study of project management professionals, it was established that the key to the success of a complex project is soft skills (Azim et al., 2010). In this regard, Shenar (2017) asserts that project management is 20% science and 80% art. Azim et al. (2010) also maintain that the most vital soft skills are communication, motivation, delegation, ownership, sense of achievement, and leadership skills.

Furthermore, Schroeder (2014) proposes that the nature of the art of project management is generic and requires specific artistic skills for a wide range of project management situations. He calls for the right balance of scientific and artistic skills in project management. This corroborates other authors' observations on the issue. However, Schroeder is a bit more direct and explicit about the notion than others. Warburton and Kanabar (2016) on the other hand, propose that project management is considered a science because of the use of the technical skills applied by project managers. In this respect, Sukhoo et al. (2005) argue that "hard skills, often described as a science and comprising processes, tools, and techniques applied to projects are the main focus of many project management methodologies". These two studies are consistent with observations by Feranades (2014) but articulate the concepts differently. Sukhoo et al. (2005), as is Fernandes (2014) however, also argued on the side of art.

Bidanda and Hackworth (2004) on the other hand, assert that common techniques and methods embedded in project management software packages such as WBS charts, network diagrams, Gantt charts, PERT charts, S-curves, resource charts, earned-value charts, and tracking tools are the dominant applications in some project management environments. In

practice, project managers tend to view the applications of these tools and techniques as more science than art. This supports the view echoed by Sukhoo et al.

The above sentiments are partially captured in the definition of project management by the PMI which defines project management as," the application of knowledge, skills, tools, and techniques to project activities to meet project requirements" (PMI, 2017.). This definition emphasizes the scientific aspect of project management, albeit implicitly. This does not necessarily mean that PMI is in negligence of the artistic importance of project management. In fact, one would argue that PMI is gravitating more towards the importance of soft skills in project management. A look at the PMI Talent Triangle® Update entitled "The PMI Talent Triangle® is Evolving", reveals the importance PMI attaches to the application of soft skills in the practice of project management. PMI (2022) articulates the following about the changing world of project management thus:

> In our changing world, project [management] professionals must be more nimble and resourceful than ever to keep pace and create impact. PMI has always been committed to empowering project professionals to develop a robust set of skills, but project professionals now need a skillset inclusive of different disciplines and practices, as well as other in-demand skills. To help project professionals navigate this changing world of work and embrace smarter ways of working, we've updated the sides of the PMI Talent Triangle to now focus on Ways of Working: formerly Technical Project Management; Power Skills: formerly Leadership; Business Acumen: formerly Strategic and Business Management. (https://www.pmi.org/certifications/certification-resources/maintain/pmi-talent-triangle-update)

The updated Talent Triangle recognizes the fact that managing projects require much more than the application of technical skills as noted by Kerzner (2013), Sukhoo et al. (2005), Feranades (2014), Shenar (2017), Azim et al. (2010) earlier. It emphasizes the fact that the evolving project management landscape necessitates the project management professionals to possess balanced technical, leadership, strategic, and business management skillset. This is necessary for project management professionals to continue to remain relevant, create value, and make an impact.

For Abyad (2018), a poorly motivated project team can unravel the best project plan. This supports the contention that there should be a right balance of scientific and artistic skills in project management (Schroeder, 2014). The evolving PMI Talent Triangle® corroborates this contention. Next, the individual aspects of the two-dimensional constructs of project management are discussed.

Project Management as Art

Hardison (2010) observes that "An art is where knowledge is expressed in a subjective representation, while a science is where knowledge is acquired hence being objective." In

other words, art is seen as subjective as it expresses what one thinks, and it differs from one individual to the other. Science, on the other hand, is objective because the knowledge that is acquired tends to remain the same across the world. Along this line of thinking, Science is seen as the process of discovering the deep organizations of nature through rational methods which are: linguistic precision, impartiality, and repeatability. Contrary to this sentiment, Richmond (1984) argues that art involves the subjectivity-reliance on the desires and personality of the artist and does not require verbal correctness.

"Project Management needs a profound knowledge of human behavior and the ability to skillfully apply appropriate interpersonal skills" (Pourdehnad, 2007). Tran (2015), views art as perceived in management as the ability to apply skills in the process of getting things done through available people and resources. In other words, the artistic side of project management depends on how people get things done, depending on their skills. "A pre-defined algorithm cannot be able to manage risks, issues, assumptions, dependencies, scheduling, analysis, resource fluctuations, and implementation planning therefore, a project manager will require to focus on communication and resource management" (Feranades, 2014). Creativity and diplomatic skills are needed when communicating with the team and stakeholders. "A team that is not motivated will fail to reach project goal, therefore, good soft skills are very essential than just basing your project on technical skills" (Schenkel, 2015). This is the reasoning expressed by PMI (2022) in the updated PMI Talent Triangle®. "A project manager can be an expert at tracking metrics and calculating risks but without soft skills, it might be hard to reach project objectives due to failure to communicate with stakeholders and project team" (Tran, 2015). In essence, the project manager needs to exhibit a certain level of leadership, enabling, motivating, and communicating with the project team and that's the artistic aspect of project management. Vinje and Burke (2007), support Tran's assertion by saying that an artistic project manager is able to guide the team when work priorities shift, when resolving issues, and when determining which information to communicate when, and to whom. To this end, Tran adds "The ability to seek solutions to problems and push through unforeseen events and in the end meeting all the project needs within the set constraints, is an exhibition of art in project management" (Tran, 2015).

Successful projects are also the result of good leadership and management. A project manager needs soft skills that will motivate and lead the project team. Soft skills or creativity can be referred to as the artistic skills that one needs to have at running a project. Project Managers need to have an art form, and leadership, and should be able to communicate with various stakeholders. Experience shows that project managers who use this approach are

likely to make quick decisions and can easily turn around team members. One should note that there are certain industries that cater to such processes. However, one may urge that artistic managers may miss a lot of details if they go wrong, and it might be very difficult for them to get things back on track.

Further, some of the project management artistic attributes are leadership, stakeholder management, communication, and above-average intuition. The most vital soft skills are communication, motivation, delegation, ownership, a sense of achievement, and leadership skills (Azim et al., 2010). It is further stated that “People deliver successful projects and not just the application of methods and tools”.

There are various ways a timetable can be made. It appears to be quite certain, however, that individuals have their very own strategies. Ten diverse project managers can create ten unique timetables, and everyone can presumably complete the undertaking. The art of project management is the capacity to foresee chaos and handle issues as they emerge, regularly without notice and with no planning (op. cit.).

Larson and Gray (2014) argue that in contrast to the orderly world of project planning, this dimension involves the much messier, often contradictory, and paradoxical world of implementation. In their thinking, art becomes an integral factor when the Project Manager applies what is significant and important in that science. They maintain that the structures, for instance, do not reveal to you how to do it. The structure, they continue, simply discloses to you what should be possible (not really a terrible thing). They caution project team members to get familiar with the how alone or from others' encounters. They stressed that art is the piece that may eventually have an effect between project success or venture failure. This supports Feranades (2014) contention of a ratio of 60:40 percent for art and science mix in a project management encounter. In this space, the Project Manager tries to meet stakeholders’ expectations, inspires team members, consults for assets, connects with the board, and impacts choices concerning the demand for scope changes. All these require delicate aptitudes [soft skills]. This observation is supported by Belzer (2001) who focuses on the role of a project manager and neglected the hard [technical] skills embedded in the project team.

Project Management as Science

It is articulated that “Project management expects that there are series of tools and techniques that should be used for budgeting, scheduling, resource planning, [controlling], and estimating. These are based on mathematical principles and formulae” (Feranades, 2014). For

Schenkel (2015), the Execution of a project is based on principles, dependencies, demands, and defined results; therefore hard skills are required to use such tools and techniques. In Schenkel's view, the principle is a science as there is a systematic method that needs to be followed to satisfy the needs of a project. There is also a requirement for a certain set of techniques to complete specific tasks in the project. "There is a need for distinguishing roles when it comes to creating a solid schedule, budget, and resources" (Vinje & Burke, 2007). Project management is technical because a "Project has a time and cost constraint and there is a need to deliver the required scope and quality" (Williams, 2008). Briggs (2012) proposes that work must be done to produce the required project deliverables and satisfy the sponsor or customer to ensure the project objectives are accomplished and deliverables meet the stated requirements. Along a similar line, Pourdehnad (2007) proposes that the aim of project management is to provide a framework to ensure that project objectives are reached. Project management is deemed a science because it has theories and frameworks that are needed to apply in order to execute the project as required. Tran (2015), argues that for a project to be successful it requires scientific skills that can be measured by its efficiency and effectiveness. Efficiency in this context refers to doing things right such as sticking to the project timeframe, budget, scope, and quality; while effectiveness is doing the right things like meeting the objectives and customer needs and requirements (ibid.).

Similarly, one needs to have a project plan to run a successful project. It has been established in practice that the more the project plan is detailed, the higher the chances of delivering a successful project. Projects are executed from available limited resources and are prone to risks all of which require the appropriate use of tools and techniques. This is particularly true for project managers who use sophisticated project management software in their planning and executing phases of the project life cycle.

Project Managers use standards and methodologies such as the APMBOK™ Guide, PRINCE2™, and the PMBOK® Guide, depending on the project management team's choice of framework and practices. Larson and Gray (2014), view the science part as consisting of the formal, disciplined, purely logical parts of the process. They propose that the technical dimension includes planning, scheduling, and controlling projects which are scientific. For Levasseur (2010) these hard skills are learned. They are not inborn traits of any individual.

Briggs (2012) maintains that projects are fraught with risks and uncertainty; they face different resource constraints, require different outcomes, and are performed in different environments. He further stresses that how the discipline is described, categorized, and classified depends on a frame of reference, based on context. This suggests that project

management is both a science and an art. However, the degree to which project management is a science or an art is a matter of contention. This is partly what motivates this investigation as articulated in the introductory section of this study. Therefore, the following two subsections will examine some of the debates surrounding this contention.

Project Management as More Art than Science

If a PMO is doing the governance part only, the project management is used as more art than Science in a ratio of around 60:40 (Fernandes, 2014). It is common knowledge that such an environment emphasizes communication, creativity, and soft skills usage in managing projects. Fernandes maintains that soft skills are far more essential than a purely technical basis of the project. For this reason, Fernandes argues that project management is more art than science. This is, however, only one side of her argument.

Shivakumar (2018) concurs with Fernandes saying that the art of managing and leading people is more vital than the science of [using] tools in project management. In Shivakumar's view, the efficient application of soft skills influences and enhances project success more. He further observes that this includes issues such as managing different cultures, being able to motivate the teams, putting stakeholders' expectations in mind, solving problems, being in line with project objectives, and making quality decisions (ibid). These are in line with one of the two-dimensional constructs that constitute the focus of this study.

Project Management as More Science than Art

Projects require defined boundary conditions such as start and end dates, defined resources, dependencies, and defined results. Considering these facts, Fernandes (2014) believes that project management is neither about being creative nor is it about soft skills. She posits that without a defined approach, the right tools, and hard skills, the soft skills will not matter at all. For these reasons, Fernandes argues that project management is more science than art. This is a counter-position to her previous stand on the issue. Fernandes seems to be articulating from both sides of the debate. Therefore, this is the second side of Fernandes's argument on the issue. Nonetheless, Schenkel (2015) agrees with Fernandes that project management is more science than art. For Schenkel, project execution is based on principles; project progress is monitored with the help of stated requirements; project teams usually adhere to defined boundary conditions, and the defined approach uses the right tools and hard

skills in the process. These are in line with the second of the two-dimensional constructs that constitute the focus of this study.

Project Management as Both Art and Science

"Project managers who excel just in either the science or the art part are less effective than those who are able to skilfully combine the two" (Vinje & Burke, 2007). Warburton and Kanabar (2016) echo that sentiment saying that "It is required for the project manager to be able to understand the technical issues in order to communicate well with stakeholders and that there is always an artistic aspect in every technical analysis. To this end, Pourdehnad (2007) suggests, the combination of an effective leader and skilled technicians will help in reducing project failures and creates a proper foundation for project success. Virine and Trumper (2008), offer a similar idea arguing that "Project management requires two separate disciplines when it comes to decision analyses which are: the psychology of judgment in decision making and mathematics including statistics". In this respect, Larson and Gray (2014) discuss the project management process from a two-dimensional perspectives: Sociocultural and Technical" considerations. According to their framework, the Sociocultural dimension includes leadership, problem-solving, teamwork, negotiation, politics, and customer expectations. The Technical dimension, on the other hand, includes scope, WBS, schedules, resource allocation, baseline budgets, and status reports.

The two dimensions articulated by Larson and Gray capture the two-dimensional constructs under consideration in this study. In the current typology, the Sociocultural dimension represents the art component and the Technical dimension represents the science component of the two constructs. Varghese (2020) in his *Online Certification course under Project Planning and Control* posits that Project Management is a bit of both science and art. During his presentation, he stated that engineers argue that Project Management is more of a science. He highlighted that the art side is person dependent in that it consists of political acumen, business acumen, people acumen, and leadership whereas the science part includes the techniques, methodologies, processes, and tools. These views are corroborated by many others including Marck Moskowitz (2018) who specifically postulates that in his experience, most Project Managers are in the 70/30 range in terms of how they split the approach between art and science or science and art, but his view is that the best project managers will be closer to a 50/50 ratio in terms of applying artistic and scientific approaches in their project management practice. This is the closest argument in the literature that speaks to *RQ2* and H_2 of the research questions and hypotheses formulated earlier respectively. *RQ2* and H_2 see project management as much art as it is science.

The contentions of both Varghese and Moskowitz relate directly to the focus of this study and hence the empirical activities of this research. Given the strong link between the research questions, hypotheses formulated, the empirical activities for this study, the search for answers, and Varghese's and Moskowitz's contentions, the discussion of results will make reference to this literature.

In his Diamond Perspectives book, Shenhar (2017), CEO of Diamond Based Institute is of the view that no matter how much tools and processes one has, one will always use personal solutions. He argues that the science part of project management constitutes 20% (WBS, Gantt Chart, PERT, CPM, PMBOK, Agile, lean, TOC) and the remaining 80% is made of art and that this 80% which includes uncertainty, complexity, innovation, business focus, leadership, motivation, inspiration, politics, trust, and integrity, is what makes projects successful. This contention has residence in the literature by those who contend that art, quite simply, is all the other things not driven by science. In this view, these are the souls of what impedes, and drives, effective projects. Given these positions, it is obvious that authors who espouse these views would assign more weightage to the artistic component than the scientific component towards project management. This, again, is a contradiction of *RQ2* and H_2 of this study which asks whether or states that project management is as much art as it is science.

Project management has evolved over the years. It has socially constructed the environment we are living in. We need to trace back its evolution to understand whether it is science or art. The classification of project management can basically be realized by the project management professionals who understand the methods and techniques that they use in managing their projects. However, there will always be a different view on the scope of skills and application of the subject. This will be true because the views are socially constructed. Nevertheless, for projects to be delivered successfully, project managers should possess both sociocultural and technical dimensions as argued by Larson and Gray (2014). These two dimensions are the soft and hard skills captured in the art and science dimensional constructs, this study focuses on. Briggs (2012) in one of his previous works along with others spoke to this view.

Given the various arguments advanced thus far, one can conclude that the question as to whether project management is science or art entirely depends on a variety of factors: the environment one is working in, the type of project one is undertaking, the methods applied, and the tools and techniques one would be applying. Project management reflects a highly technological evolvement with a socio-rationalistic orientation, argues Packendorff (1995). In

his contention, some project managers view project management as more science, some others view it as more art. Nevertheless, almost all project managers view project management as both art and science as articulated by Briggs (2012) and others highlighted previously. This implies that the art and science components of the project management process are not mutually exclusive. They are in other words, complementary to each other. Just as Fernandes (2014) argued earlier, it is very difficult to conclude whether project management is an art or a science, and in the case that it is both, which has more weighting. It is succinctly put thus: Science provides knowledge and art deals with the application of knowledge and skills. Science offers the knowledge and for project managers to be successful in their job they should possess the knowledge of science and the art of utilizing it. The PMHut discussion of 2009 on the question concerning whether project management is an art or a science reveals that the majority of the respondents think project management is both an art and a science. One can then conclude that project management is neither only a science nor only an art, but a combination of both constructs. This sentiment can be summed up with a quote by "Will Durant", the American Historian when he articulated that, "Every science begins as philosophy and ends as art" (Schaffer, 2015).

Summary

It could be said that project management in practice is both art and science. Science provides the knowledge and art deals with the application of knowledge and skills. Science offers the knowledge and for managers to be successful in their job they should possess the knowledge of science and the art of utilizing it, as stated above. In other words, science is the body of knowledge, methods, principles, tools, and techniques underlying the practice of the discipline. Art, on the other hand, is the application of science. The notion of project management as both art and science is well established in the literature and in practice. However, whether project management is more art or more science is still a matter of contention. Through a critical review of related extant as well as contemporary literature, a gap in the existing literature was identified. This research project takes the study one step further by posing research questions that were largely ignored and through the collection and analysis of empirical data and testing of hypotheses, answered the research questions and hypotheses.

RESEARCH METHODOLOGY

This section discusses how the research was conducted and what philosophical assumptions underpin the research project. In this respect, the research strategy adopted; the sampling

techniques used; data collection method adopted; the techniques used to analyse the collected data; and the philosophical tradition that underpins the study are discussed.

The Research Strategy

A variety of research strategies exist in social sciences research. Among these strategies, the survey strategy appears to be well suited for the needs of this study. Denscombe (2014) defines a strategy as a plan of action designed to achieve a specific [research purpose] goal. Denscombe maintains that in themselves, research strategies are neither "good nor bad", nor are they either "right or wrong". It is only in relation to how they are used that they can be judged as being good or bad, right, or wrong (ibid.). Considering the purpose of this study: to assess whether project management is more art or science and whether learners' perceptions of the two constructs are influenced by their program of study, the survey strategy seems to be a useful and appropriate strategy. Hence, this study adopts the survey research strategy within a quantitative method research design. Considering the various arguments presented in the previous section and the author's position in the debate, one might be inclined to think that the author holds a positivist philosophical tradition.

Sampling Technique

A population is defined as the entire set of individuals of interest to a researcher (Gravetter & Forzano, 2012). In this respect, the target population of this study is all learners enrolled in graduate-level project management courses of studies at the two referent institutions. This is the group the researcher defined for his specific interest (ibid.). Clearly, the researcher may not have access to all these learners to recruit as a sample for participation in the study. This is because class sessions are not always 100% in attendance. However, the researcher would have access to most of the students enrolled in the graduate-level courses in project management at the two institutions. Therefore, those students enrolled in graduate-level courses in project management at these two institutions and who are available for selection constitute the accessible population from which the sample for this study is selected (ibid.). At the time of this study, there were 170 students enrolled in graduate-level project management courses at these institutions. Therefore, the accessible population for this study is 170. From now on, this will be referred to simply as the population or the target population.

The researcher is interested in selecting a representative sample from the population. This would enable him to generalize the results of the study to the target population. The degree of representativeness of a sample depends on how closely the sample mirrors or resembles the population (ibid.). Gravetter and Forzano (2012) refer to the extent to which the characteristics of the sample accurately reflect the characteristics of the population as the

representativeness of the sample. The likelihood of the sample being representative, however, depends on the procedure that is used to select the participants or respondents. In this respect, sampling is the process of selecting individuals for a study. Various approaches to sampling and specific strategies or techniques for obtaining samples are available to researchers.

The law of large numbers states that the larger the sample size, the more likely it is that values obtained from the sample are similar to the actual values for the population. In other words, the bigger the sample is, the more accurately it represents the population. A variety of different sampling methods (also called sampling techniques or sampling procedures) have been developed by researchers. These sampling methods (types) fall into two basic categories or sampling designs: probability sampling and nonprobability sampling. However, for the purpose of this study, a probability sampling design was adopted. Gravetter and Forzano (2012) note that in this technique, the entire [target] population is known, each individual in the population has an equal chance [probability] of being selected, and sampling occurs by a random process based on the probabilities. For Sekaran and Bougie (2012), in probability sampling, the elements in the population have some known, non-zero chance or probability of being selected as sample subjects. This study satisfies the mathematical assumptions needed for inferential statistical analysis. There are a variety of probability sampling techniques or procedures: simple random, systematic, stratified, proportionate stratified, and cluster sampling. A random process in this context refers to a procedure that produces one outcome from a set of possible outcomes (op cit.). Given the relevant target population of focus for this study, the parameters of interest to be investigated, and the type of sampling frames (class rosters) available, the systematic sampling technique is the most appropriate and hence it is used in this study.

Out of the 170 students enrolled at the two referent institutions, 90 students were enrolled in the School of Business and Management Studies (SOBMS) graduate-level project management courses while 80 students were enrolled in the Faculty of Engineering and Technology (FET) graduate-level project management courses. School of Business and Management Studies (SOBMS) and Faculty of Business and Management Studies (FOBMS) are used interchangeably in this study. A sampling frame is a (physical) representation of all the elements in the population from which the sample is drawn (Sekaran & Bougie, 2012). A roster of class students could be the sampling frame for the study of students in a class (ibid.). Given the target population of interest for this study, the sampling frame is the class roster of each program containing a numbered listing of all the students enrolled in the graduate-level project management courses at the two referent institutions who were available. To use a systematic sampling procedure in selecting the subjects for the sample, a starting number

from the sampling frame was first randomly chosen. After the first participant was randomly selected, every nth number on the list following the first selection was chosen. In this case, the size of n was calculated by dividing the population size by the desired sample size.

For this study, the researcher was interested in selecting 80 participants from the 170 target population. Therefore, 170 divided by 80 is 2.125. Since a person cannot be fractionalized, the nth in this case was rounded down to 2. This is the same as 90/40 = 2.25 and 80/40 = 2 in each program of study. The numbers were normalized so that the two student groups have equal sample sizes. In this case, each program of study was represented by 40 respondents. While the number of respondents in each group is altered, the sample size remains unchanged. For the remainder of this section, the data collection methods and the data analysis techniques (research methods) used are discussed.

RESEARCH METHODS

The goal in this section is to understand and describe the presumed dependent variable, or to explain its variability. This is the variable that lends itself to investigation as a viable factor. By analyzing the scale items in the questionnaire as they relate to the learners' perception and finding out what variable influences it, it is possible to find answers or solutions to the research problem/questions/hypotheses. To achieve this goal, it is necessary to quantify and measure the variables in question.

A variable is anything that can take on differing or varying values (Sekaran & Bougie, 2012). In this study, the two variables of interest are the graduate programs of study and the learners' perception of project management regarding the two-dimensional constructs. It should be noted that perception is an abstract concept. Therefore, it has to be reduced from its level of abstraction and operationalized in such a way that it becomes measurable (Sekaran & Bougie, 2012). However, in this study, "perception" is the variable of primary interest to the researcher. It is measured on the level of agreement or disagreement to the scale items. Here, perception will be labelled as the presumed dependent (criterion) variable and program of study will be labelled as the presumed independent (predictor) variable. This study adopts a survey research strategy designed to establish a relationship and differences. Therefore, a correlation is not causation. A questionnaire is the chosen data collection instrument used in this study.

Data Collection Instrument

The data collection instrument was divided into two sections: A and B. In section A, respondents were asked on a scale from 1 ("strongly disagree") to 5 ("strongly agree") to

indicate the extent to which they disagree or agree with a series of statements. This produced a measure of the respondents' perceptions about project management concerning the two-dimensional constructs under investigation. The following table shows the coding frame used to produce the numerical data.

Table 1. Coding Frame

Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)
1	2	3	4	5

Section B asked respondents to provide demographic information such as age, gender, and program of study. The two sections of the questionnaire produced both numerical and categorical data which were used in the data analysis phase of the study. This, in turn, enabled the researcher to answer the research questions and the formulated research hypotheses. First, the data from section B (the demographic data) will be discussed.

Data Analysis, Results, and Discussions

The Research Questions

RQ1. Is there a relationship between learners' program of study and their perception regarding the two-dimensional constructs of project management?

RQ2. Is project management as much art as it is science?

RQ3. Is there a statistically significant difference between the perceptions of learners from different project management programs of study towards the two constructs?

Results

Table 2a. Program of Study at = School of Biz and Mgmt Studies

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
PM is more Sci	40	1	2	1.85	.362
PM is more Art	40	4	5	4.30	.464
Valid N (listwise) per	40				

a. Program of Study at: SOBMS or FOBMS

Table 2b. Program of Study at = Faculty of Engrng and Technology

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
PM is more Sci	40	4	5	4.38	.490
PM is more Art	40	1	2	1.55	.504

Valid N (listwise) per	40				

a. Program of Study at: FET

When the data file was split by Program of Study, separate descriptive statistics were calculated for SOBMS or FOBMS and FET learners. From tables 2a and 2b, there appears to be a huge difference between the perceptual levels reported by these two groups of learners regarding the two project management constructs. These differences are discussed in the discussion section of this paper.

As expected, from table 2a, SOBMS learners perceive project management as more art than science (n = 40, mean = 4.30 with SD = .464) and from table 2b, FET learners reported perceiving project management as more science than art (n = 40; mean = 4.38 with SD = .490). These scores are from a range of 1 to 5 scale as presented in table 1. The mean of one program of study is almost the opposite of the mean of the other. These differences show that learners' perceptions of the two constructs of project management are influenced by their program of studies. The outputs in tables 2a and 2b **provide the answers to *RQ1* and partially to H_1.** A relationship is established. It means that learners' perception of project management is influenced by their learning orientation as indicated.

NOTE: It should be noted that normally, the mean as a measure of central tendency only makes sense if the data are measured on an interval or ratio scale. However, some scholars argue that multiple-item measures of concepts, like Likert scales (Table 1 in this case), produce, strictly speaking, ordinal variables. In this respect, these scholars argue that ordinal data can be treated as though they produce interval/ratio variables. These writers maintain that this is because of the relatively large number of categories the items generate. This position was articulated by Bryman and Bell (2011); Saunders, Lewis, and Thornhill (2016); Blumberg, Cooper, and Schindler (2011). Therefore, in this study, it makes sense to report the mean scores of the dependent variable of this study. However, it does not make sense to report the mean score for the program of study (the presumed independent variable) since it is a categorical variable measured on a nominal scale. Questions 2 and 3, as well as the hypotheses, are answered later.

DISCUSSION AND ANALYSIS

Hypotheses

H_1: There is no relationship between learners' program of study and their perception regarding the two-dimensional constructs of project management.

Firstly, a chi-square test of independence (with $\alpha = .05$) was conducted on H_1 stated above. The test was intended to evaluate whether there is a relationship between learners'

program of study and their perception regarding the two project management constructs. The two constructs considered in this study are whether project management is more art than science or whether project management is more science than art. Table 3 is the output of the first part of the hypothesis (i.e., PM is more Art than Science). From table 3, it can be seen that there is a relationship and that the relationship is statistically significant with, χ^2 (1, N = 80) = 8.170, $p < .001$. This leads to the partial rejection of hypotheses H_1 and H_3 as well as questions 1 and 3. Besides showing a relationship between the two presumed independent and dependent variables, the results show that the relationship is statistically significant ($p < .001$) which is below the chosen level of significance ($p < .05$).

Table 3. Program of Study * PM is more Art than Science

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.170[a]	1	<.001		
Continuity Corrections	5.818	1	<.001		
Likelihood Ratio	7.343	1	<.001		
Fisher's Exact Test				<.001	<.001
Linear-by-Linear Association	6.468	1	<.001		
N of Valid Cases	80				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.18.

b. Computed only for a 2x2 table

The footnote below the chi-square test table (Table 3) indicates that 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.18 which is much greater than 5. This means that one can be confident that one of the assumptions for a chi-square test has not been violated.

Secondly, a chi-square test of independence (with $\alpha = .05$) was conducted on H_1 stated above. The test was intended to evaluate whether there is a relationship between learners' program of study and their perception regarding the two project management constructs. The two constructs considered in this study are whether project management is more art than science or whether project management is more science than art. Table 4 is the output of the second part of the hypothesis (i.e., PM is more Science than Art). From table 4, it can be seen that there is a relationship, and that the relationship is statistically significant with, χ^2 (1, N = 80) = 6.170, $p < 001$. This also leads to the partial rejection of hypotheses H_1 and H_3 as well as questions 1 and 3. Besides showing a relationship between the two presumed independent and dependent variables, the results show that the relationship is statistically significant ($p < .001$) which is below the chosen level of significance ($p < .05$). This completes the responses to hypotheses H_1 and H_3 and questions *RQ1* and *RQ3* as stated in the introductory section.

Table 4. Program of Study * PM is more Science than Art

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.170[a]	1	<.001		
Continuity Correction[b]	4.818	1	<.001		
Likelihood Ratio	7.343	1	<.001		
Fisher's Exact Test				<.001	<.001
Linear-by-Linear Association	5.468	1	<.001		
N of Valid Cases	80				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.50.

b. Computed only for a 2x2 table

The footnote below the chi-square test table indicates that 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.50 which is much greater than 5. This means that one of the assumptions for a chi-square test has not been violated.

H_2: Project management is as much art as it is science.

Thirdly, a chi-square test of independence (with $\alpha = .05$) was conducted on H_2 stated above. The test was intended to evaluate whether Project Management is as much art as it is science. Table 5 is the output of H_2 (i.e., PM is as much art as it is science). From table 5, it can be seen that learners from the two program of studies responded similarly. However, at this instance, the two groups of learners disagree that Project Management is as much Art as it is Science, and that the differences in their views of H_2 is statistically significant with, χ^2 (1, N = 80) = 8.000, p < 001. This also leads to the rejection of hypothesis H_2. Besides showing a relationship between the two presumed independent and dependent variables, the results show that the relationship is statistically significant (p < .001) which is below the chosen level of significance (p < .05). This completes the responses to hypothesis H_2 and *RQ2* as stated in the introductory section.

Table 5. Program of Study * PM is as much Art as it is science

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.000[a]	1	<.001		
Continuity Correction[b]	7.050	1	<.001		
Likelihood Ratio	9.204	1	<.001		
Fisher's Exact Test				<.001	<.001
Linear-by-Linear Association	8.300	1	<.001		
N of Valid Cases	80				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.25.

b. Computed only for a 2x2 table

The footnote below the chi-square test table (Table 5) indicates that 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.25 which is greater than 5. This means that one can be confident that one of the assumptions for a chi-square test has not been violated.

These results confirm the majority of the views in the literature as observed by Warburton and Kanabar (2016), Pourdehnad (2007), Virine and Trumper (2008), Varghese (2020) among others. Using a different population in a different context with such findings, one can see these results as validation of findings in the literature.

H_3: There is no statistically significant difference in perceptions towards project management between learners enrolled in different project management programs of study.

A hypothesis test summary was generated to confirm whether the relationship between program of study and learners' perception is statistically significant. The results clearly show that the relationship between the two programs of study concerning their perception of the two PM constructs is statistically significant at the .05 level. In fact, p <.001 as all three null hypotheses are rejected. These results support those published in the literature by Larson & Gray, 2014; Briggs, 2012; Varghese, 2020; and Sukhoo et al., 2005 among others.

CONCLUSIONS AND RECOMMENDATIONS

Finally, the fifth section provides the conclusions drawn from the study and provides recommendations for practice.

Whether project management is art or science, more art or more science, in fact, depends on the skills, methods, techniques, and training applied in a given project as well as the environment (context) in which the project is carried out. Project management does not bear absolute truth from the methods and techniques that are applied. Different combination of skills is used in project management leading to the success of the project hence, it is very difficult to conclude whether project management is science or art, and which one has more weight. Projects require both technical and social applications for their success. In essence, project management requires the development of distinct technical and management skills where some maintain that the technical part of project management is scientific whereas the managerial aspect of project management is artistic. These positions are supported by the literature and corroborated by the results from the empirical activities of this study.

Most students, academics, scholars, and practitioners of project management would easily say that project management is both art and science. However, most would struggle to allocate

numerical values to either side of the debate. After all, perception is a social construct. As such it cannot be placed with any mathematical exactitude. Applying mathematical precision to project management will lead to flat-out failure. Different phases and aspects of the project lifecycle demand different or mixed-dimensional constructs. The weightage of art or science in any of the phases or aspects of the discipline and practice is circumstantial. One needs to contextualize the space, knowledge, skills, tools, and techniques needed to make the call.

The findings from this study corroborate previous research findings. Project management is not an exact science. In project management, science and art are not mutually exclusive, rather they are complementary to each other. Therefore, whether project management is art or science is a matter of debate in terms of context, skills, methods, and techniques applied. This is demonstrated by the respondents in this study. Learners enrolled in a project management program with engineering and technology orientation would view project management as more science whereas those enrolled in a project management program with business and management orientation would view the discipline and practice as more art. The beauty, in fact, lies in the context as well as the skills, methods, and techniques applied. Finally, considering project management as more art or more science also depends on similar thinking and perceptions as the findings in this study indicate. Therefore, whether project management is 60/40 in favor of art or 60/40 in favor of science, again depends on the context, skills, methods, tools, and techniques applied and needed by the project.

No project management context can be entirely technical or entirely aesthetic. Most project management practices or programs of study involve a blend of art and science. The two constructs coexist (occur together). Nevertheless, the result of the current study is one addition to the lack of consensus among authors in the debate about the constructs under study. Furthermore, the inferential statistical techniques result also confirms that the relationship between learners' perceptions and their programs of studies is statistically significant at the $p < 05$ levels.

Recommendations

The author recommends that considering project management as art or science, or more art or more science by academics, learners, institutions, or Liberians would depend on the context, skills, methods, tools, and techniques applied and needed by the project. For academics and institutions, this means considering the content, tools, and techniques emphasized in the teaching and learning spaces. For practitioners, it means considering the skills needed for the project, the roles, and the context in which the project is carried out. And for Liberians, it

means considering the content of the learning materials and the target audience for those resources.

REFERENCES

Abyad, A. (2018). Project Management, Motivation Theories and Process Management. Middle East Journal of Business, 10.

Association for Project Management Body of Knowledge (APMBOK, 2006), 5th Ed. Buckinghamshire, United Kingdom: Author.

Azim. S, Gale A, Lawlor-Wright T, Kirkham R, Khan A, Alam M (2010).The importance of soft skills in complex projects. Business Strategy Series, 398.

Belzer, K. (2001). Project Management: Still More Art Than Science. Retrieved August 30, 2019, from http://www.pmforum.org/library/papers/2001/0102papers. htm#01

Blumberg, B., Cooper, D. R., and Schindler, P. (2011). *Business Research Methods* (3rd ed.). Berkshire, UK: McGraw-Hill Education.

Briggs, D. G. (2012). Reassessing Project Management: A Science or an Art? *International Journal of Engineering and Management Sciences (IJEMS)*, Vol. 3(4), pp. 507-512. ISSN: 2229-6425.

Bryman, A. and Bell, E. (2011). *Business Research Methods* (3rd ed.). New York: Oxford University Press.

Cattan et al. (2011). *Project-Based Organizing and Strategic Management. Advances in Strategic Management.* Emerald: ISBN 978-1780521930.

Denscombe, M. (2014). *The Good Research Guide: For small-scale social research projects*. Maidenhead, England: Open University Press.

Feranades, J. (2014, September 26). *What is Project Management - An Art or Science or Both?* Retrieved from Whizlabs: https://www.whizlabs.com/blog/what-is-project-management-an-art-or-science-or-both/

Gravetter, F. and Forzano, L. B. (2012). *Research Methods for the Behavioral Sciences* (4th ed.). Belmont, CA: Thomson Wadsworth.

Hardison, K. P. (2010, May 23). *What is the difference between art and science?* Retrieved August 26, 2019, from eNotes Editorial: https://www.enotes.com/homework-help/deference-between-art-science-172919

Kerzner, H. (2013). *Project Management: A systems Approach to Planning, Scheduling, and controlling* (11th ed.). Hoboken, NJ: John Wiley & Sons

Kloppenborg, Anantatmula, and Wells (2019). Contemporary Project Management. Boston, MA: Cengage Learning.

Larson and Gray (2014). *Project Management: The Managerial Process* (6th ed.). New York, NY: McGraw-Hill Education.

Levasseur, R, E. (2013). People skills: Ensuring project success— A change management perspective. Interfaces 40(2):159–162.

Moskowitz, M. (2018). Project Management: Art or Science? Retrieved on 10th May 2021, from, https://www.linkedin.com/pulse/pm-art-science-marc-moskowitz.

Packendorff, j. (1995). Inquiring into temporary organisation: New directions for project management research. *Scandinavian journal of management*, 319-333.

PMHut (2009). Is Project Management an Art or Science? https://pmhut.com/is-project-management-art-or-science

Projects In Controlled Environment (PRINCE2™). (2009). Managing Successful Projects with PRINCE2™. Norwich, London: The Stationary Office for Office of Government Commerce.

Project Management Institute. (2017). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 6th ed.* Newtown Square, PA: Athor.

Project Management Institute (2022). *PMI Talent Triangle® Update: The PMI Talent Triangle is Evolving*. Retrieved on 23rd July 2022, from, https://www.pmi.org/certifications/certification-resources/maintain/pmi-talent-triangle-update

Pourdehnad, J. (2007). Synthetic (integrative) project management: an idea whose time has come. *Business Strategy Series, 8*(6), 426-434.

Richmond, S. (1984). The Interaction of Art and Science. *Leornado, 17*(2), 81-86. Retrieved from http://www.jstor.org/stable/1574993

Saunders, M., Lewis, P., and Thornhill, A. (2016). *Research Methods for Business Students* (7th ed.). Harlow, UK: Pearson Education.

Schaffer, D. (2015). Project Management: Art or Science? Retrieved 9th May 2021 from, https://www.proprojectmanager.com/project-management_art_or_science/

Schenkel, M. (2015, March 04). *Project Management: Is it art or science?* Retrieved from Microtool Website: https://www.microtool.de/en/project-management/is-project-management-art-or-science/

Sekaran, U. and Bougie, R. (2012). *Research Methods for Business: A Skill Building Approach* (5th ed.). West Sussex, UK: John Wiley.

Shenhar, A. (2017).Is project management an art or science. Retrieve 30th May 2020,from https://www.youtube.com/watch?v=xKrV2ceneDg

Shivakumar, S. K. (2018). People Management in Digital Projects. In *Complete Guide to Digital Project Management* (pp. 227-245). Apress, Berkeley, CA.

Tran, L. (2015, June 26). *The Art, Science and Craft of Project Management.* Retrieved from InLoox Blog: https://www.inloox.com/company/blog/articles/the-art-science-and-craft-of-project-management/

Varghese, K. (2020). Is Project Management An Art or A Science"? Retrieved 5th May 2021, from, http://www.infocobuild.com/education/audio-video-courses/architectural-and-civil-engineering/project-planning-and-control-iit-madras.html

Vinje, M., & Burke, M. (2007, January 05). *Project Expert: Balancing Art and Science in Project Management.* Retrieved from TechTarget Network: https://searchcio.techtarget.com/magazineContent/Project-Expert-Balancing-Art-and-Science-in-Project-Management

Virine, L., & Trumper, M. (2008). *Project Decisions: The Art and Science.* Vienna, VA: Management Concepts Incorporated.

Warburton, R., Kanabar, V. (2016). The Art and Science of Project Management: Attitude, Books, and Conversations. (2nd ed). Newport, USA: RW-Press

Warburton, R. D., & Kanabar, V. (2016). *The Art amd Science of Project Management.* Newport: RW- Press.

Williams, M. (2008). *The Principles of Project Management.* Collingwood: SitePoint.