

ممارسات إدارة المشاريع الرشيقة في تسليم مشروع ذا لاین؛ المدينة
الذكية في المملكة العربية السعودية

**Agile Project Management Practices in The Line
Project Delivery; Smart City in Saudi Arabia**

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العام الدراسي:

2024

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Introduction

Over the years, the project management environment has been changing subtly or drastically depending on the degree of change which has been changing for decades due to evolving challenges of large projects. To support the implementation of smart city initiatives that involve the use of advanced technology and environmental preservation in the improvement of living standards, effective project management frameworks are required. APM is one of the most used approaches in software development due to its flexibility, extending processes and other factors that make it effective.

As contrasted with the conventional phased and formal project management approach, APM is implemented in a fluid and dynamic environment that encourages learning and innovations with involvement of stakeholders. This methodology is well applicable for projects entailing a higher degree of complexity and interdependence, for instance, smart city initiatives require flexible responses to new information and innovative environments.

Smart city: The Line Project – a futuristic urbanization project in Saudi Arabia refers to a novel and challenging experiment in designing an advanced environmentally friendly sustainable city. The adoption of best practices of APM can help The Line realize better project outcomes, optimized performance, risk management, and stakeholder satisfaction. The effectiveness of Agile Project Management in The Line project is discussed in this research paper with a comparison of the results gotten with the conventional project management approach (Neom, n.d.).

The objective of this research is to assess the role that APM may possibly play in enabling the success of The Line project based on the contextual nature of smart city concepts. Besides, the paper has the potential to offer some theoretical lessons into the ways in which APM could contribute towards the improvement of sustainable urban development.

Research Problem

The main research issue thus revolves around the assessment of the extent of using agile project management in the completion of the Line project which is a smart city project in KSA. Sequential process is rigid and cannot handle the short time that it takes for change to happen in cases where the smart city project is involved which requires a more adaptable vigorous approach. The issue is whether APM can give better project outcomes than traditional methods in terms of speed, customer satisfaction, and risk management, for example. More specifically, this study seeks to find out whether APM is suitable for use in The Line's innovative and large-scale setting to meet its peculiar needs.

Research Importance

The rationale for understanding the changes brought about by Agile Project Management for The Line project is as follows: Firstly, it creates a view of applying APM towards large scale infrastructure projects, whereby projects present itself as complex and uncertain. This knowledge can benefit project managers and decision makers in choosing correct methodologies for other similar undertakings. Secondly, the Line project acts as a reference point for other smart city projects across the world. Thus, the role of APM in this regard presents a framework that is useful for improving sustainability and effectiveness for urban development projects globally. Lastly, this study contributes to both academic and practical knowledge in the field of project management, particularly within the realm of smart cities. It has the potential to influence future projects and policies, encouraging the adoption of agile practices to meet the growing demands of urbanization and technological advancement. By providing empirical evidence and practical insights, this research can help shape the future of project management in smart city developments, fostering more resilient, adaptable, and sustainable urban environments.

Research Objectives

1. To evaluate the effectiveness of Agile Project Management in The Line project compared to traditional project management methods.
2. To identify the key indicators that measure progress and release benefits throughout the project lifecycle.
3. To explore the implications of APM on enhancing smart sustainable city initiatives in Saudi Arabia.

Research Questions

1. How does the Agile Project Management approach enable project success compared to the traditional approach?
2. What are the indicators that measure the progress of release benefits throughout the process rather than at the end only?
3. What are the necessary implications to enhance smart sustainable city initiatives in Saudi Arabia, and how are they linked to agile project management practices?

Research Hypothesis

1. Agile Project Management practices significantly improve project success rates in The Line project compared to traditional project management methods.
2. Continuous progress indicators provide a more accurate measure of project benefits compared to end-of-project assessments.
3. Implementing Agile Project Management practices can significantly enhance smart sustainable city initiatives in Saudi Arabia.

Previous Studies

Agile Project Management (APM) has garnered considerable attention across various sectors due to its potential to enhance project outcomes through its iterative, flexible, and collaborative approach. APM, which has been used originally for software development project management, has shown high potential in the effective control of intricate and changing projects. According to the recent research, APM has been identified to have played a significant and positive role to the software development where new features included better project delivery time and quality, and customer needs (Beck et al., 2001; Highsmith, 2004).

In construction projects, APM has been used more frequently to deal with the problems related to complex and mass construction projects. According to Johansen and Wilson (2006), implementing of APM methodologies, including Scrum and Kanban, means that teams get the potential to improve their performance by implementing changes much quicker, assessing risks well and keeping stakeholders engaged. Secondly, it provides a feedback mechanism and result in incremental progress, which is helpful in construction projects since commonly they can be bogged down by emergent issues.

The application of APM concepts has also helped infrastructure construction and urban planning. Research by Conboy and Fitzgerald (2004) found that the use of agile principles in urban planning projects had improved stakeholder cooperation, enhanced flexibility, and maximized resource use. APM's iterative methodology makes it easier to make continuous improvements and modifications, which keeps projects in line with changing urban goals and demands.

As seen in prior studies, APM has been shown to yield positive results across numerous industries; however, its adaptation in large-scale smart city projects has not attracted similar attention, especially in the Middle Eastern setting. The concept of smart cities is not just about adopting technologies but is a blend of technologies or technology enabled systems that form infrastructures within cities and hence requires a project management plan to support the changes and capture the interests of the many stakeholders involved. The Line project in KSA that aims to develop a new city with promising long-term goals, focusing on the technological and ecological aspects of sustainable city development, can serve as an essential case to understand the utility of APM in this line of work.

The literature review of smart city projects has shown that whilst prior research has addressed various technologies and infrastructures related to smart city initiatives, limited attention has been paid to the subject of effective project management methodologies. For example, a review conducted by Anthopoulos (2015) presents current and future frameworks for smart cities and notes the need to apply new technologies, such as IoT, AI, and big data, to

the context of urban living. Yet, it fails to go into much detail about how APM can enable the successful deployment and integration of these technologies into the city.

Even though the implementation of APM in the large-scale infrastructure projects in the context of the Middle East has not been quite widespread up to the present moment. A recent work by Alami (2016) on project management practices in the GCC countries highlight a relatively high level of adoption of agile methodologies with some significant barriers such as cultural resistance to change, preference for hierarchical structures and low level of awareness of agile PM. It also clearly demonstrates that the practical application and benefits of APM in the region need to be investigated in future empirical research.

The Line project, being the first global smart city prototype, is a chance to fill this gap in research. By using APM practices in this huge assignment, it will be more possible to figure out how efficient those methodologies are in implementing gigantic urban redevelopment projects in the ME context. This research could then inform similar future smart city initiatives across the area and other parts of the world to prove how APM could potentially positively impact on project performance when it comes to flexibility, engagement, and optimizing iteration.

In addition, considering the extensive literature on sustainable urban development, studying how this theoretical concept plays out in The Line project can be informative as well. The specificity of the approach embraced by APM in terms of cycling constant evolutions also responds to the permanent assessment and reflection on the environmental, social and economic sustainability processes. Through APM, The Line project can act as an example of how sustainability can be integrated into the very practices of urban development.

Even though, earlier study has demonstrated the advantages of APM in several fields, more investigation is urgently required to examine its use in expansive smart city initiatives, especially in the Middle East. There is a rare chance to close this gap and advance sustainable urban development and project management in the developing fields of Saudi Arabia's Line project.

Theoretical Foundations of the Research

Three main areas serve as the foundation for this research's theoretical framework, including models of smart city development, project success theories, and the principles of agile project management (APM). Together, these pillars provide one multifaceted lens that can be effectively utilized to evaluate the effectiveness of APM in the context of The Line project and its implications for smart city initiatives.

Agile Project Management Principles

According to the analysis, APM iterative and participative, flexible model features have been identified. Iterative development entails the division of the project into smaller and easy to handle phases or cycles known as sprints to have the ability to obtain feedback and make the modifications (APM, n.d.). This approach improves the possibility to adapt to changing needs and emergencies, which is especially important as smart city projects are implemented in complex and constantly evolving conditions. Customer collaboration relies on the active interaction and involvement of the consumers during project development and implementation

phases where their needs are met adequately. APM applicability reduces rigidity in team approaches encourages adaptability to new facts by developing strengths for adjustment and creativity.

Project Success Theories

These theories offer a theoretical perspective when assessing the success of projects apart from time, cost, and scope. Contemporary approaches to project success define multiple success factors, for instance, stakeholder satisfaction, project flexibility or productivity, achievement of potential benefits, and others. This broader perspective is more aligned with the goals that are set within smart city projects that not only include timely delivery and completion on budget, but also incorporate the aspects of sustainability, habitability, and technological integration. By applying these success criteria, the research will be in a better position to determine the actual effect of APM to The Line project.

Smart City Development Models

These models provide an understanding of technology, sustainability, and urban planning required to develop smart cities, thus improving their design. These consist of big data and analytics for data-based decision making, smart grid for integrating renewable energy resources, and smart network for effective communication and optimized operations. These models pay large attention to flexibility and incremental and iterative improvement, which are the main fundamentals of APM. Given the fact that smart cities are relatively new and will continue to grow more complex over time as well as the distributed approach typical of APM practices, the study explores how applying and advocating iterative and adjustable project management methodologies frameworks that relate to evidenced smart city development models can be useful for the relative field.

In other words, the theory of this research is based on the following three principles: Agile Project Management, three criteria for evaluating the success of projects, and three strategic frameworks for the development of smart cities. This is a helpful lens through which to examine The Line and APM's role in the project as well as the prospects for pursuing sustainable urbanization in the future.

Research Methodology

This research employs both quantitative and qualitative methods of data collection and analysis to provide sufficient assessment of the role, characteristics and usefulness of APM especially as it applies to The Line project. Incorporating these two paradigms, the study proposes to offer a consistent set of realizations on the project results and stakeholder perception to contribute to methodological validity.

Quantitative Data Collection

Primary data shall be gathered by means of structured questionnaires whereas secondary data shall be gathered through questionnaires and project performance data statistics. Interviews will be administered to the project stakeholders including the project managers, the team members and other project stakeholders in this case referred to as The Line. The next surveys will address the timelines, budget, quality, and the level of customer satisfaction with the management of projects. To avoid any suspicions with regards to its subjectivity, Likert scale questions will be used in capturing perspectives on how specifically APM has enhanced success rates. Furthermore, the assessment of Product Metrics will also involve the assessment of project performance factors such as the success rate in project closure or closed projects, number of cycles, defect density, and resource utilization. This will help in establishing scientific theories that can guide analysis of correlations between APM practices and performance of projects.

Qualitative Data Collection

Data will be collected using interviews that will be conducted with the Line project managers, top influencers, and industry experts. These interviews will provide detailed ideas regarding the various implications of APM, the benefits of ACCA's implementation, and effectiveness of its utilization. Such areas are on the use of iterative development, interaction with other stakeholders, flexibility and impression of the respondent as to the impact that APM has on projects. The deployment of the qualitative research approach helps highlight the social issues that may cause the success or failure of APM if adopted as the quantitative solution.

Data Analysis

Analysis of qualitative data will involve use of frequency distributions while probability measures will be used to make the right conclusions. Descriptive information of the study variables will be based on measures of central tendency, variance, and skewness while the relationships between the APM practices and project outcomes will be tested using regression analysis. The data collected will be analyzed thematically where the researcher is able to group and describe the data collected in relation to the participants' experience and perception.

Triangulation

Combining the qualitative and quantitative data enhances the validity and dependability of the study results through the technique of triangulation. The study aims to give an extensive analysis of The Line project where APM is involved by comparing statistical information with the views of the project team members.

This approach ensures that the study captures the productivity impacts and the underlying phenomena of implementing Agile Project Management in a smart city initiative of significance, providing valuable data for future initiatives.

Research Tools

- Surveys: To assess and measure different aspects of the project and its performance using various parameters to identify areas of satisfaction.
- Interviews: To gather qualitative data from the PMs, stakeholders as well as other professionals of the field.
- Project Performance Metrics: Since such important parameters as time, cost, quality and sustainability indicators are used.

Research Limitations

There are several limitations that may affect research on The Line project, limiting the validity and reliability of the research conclusions. Firstly, there is a potential issue of data availability for projects since they contain sensitive information which cannot be disclosed or shared with others, thus limiting the depth of analysis. Secondly, qualitative interviews as useful to provide contextual data and understand deeper perceptions may have some limitations such as perceptual or interviewer biases. Third, there are internal factors that relate to the changing nature of the Line project where the contexts surrounding project management practices and stakeholders may change with time thus may affect the outcomes and conclusion of the study based on the existing research. Though there are these drawbacks, measures to minimize biases, to improve the validity of data, and to provide an objective analysis of the results will be taken where applicable to increase the reliability and applicability of the study.

Assessing Agile Project Management for Project Success

APM is acknowledged for the specific ways it contributes to the improvement of the probability of success in projects via various elements: flexibility, stakeholders, iterations. While traditional approaches offer a more rigid project management framework that follows a sequential process, APM promotes a more fluid environment that includes feedback and adaptations as key aspects of the project process. This flexibility is especially beneficial for large-scale and pioneering constructions, for instance, The Line in Saudi Arabia – a smart city – where high adaptability to the changing conditions and demands is crucial.

Flexibility and Adaptability

Another strength is the versatility of APM which is a direct result of its design and application. These include Scrum and Kanban, and are based on short, repetitive phases called sprints. Sprints generally range from two to four weeks and are followed by a sprint review where progress is checked, and the project is altered in response to stakeholder feedback. This means that the various project teams can improve their work iteratively, address arising problems effectively and incorporate new requirements as they come. In terms of your framework, this flexibility allows the incorporation of revolutionary technologies and best practices into The Line project allowing for flexibility to respond to new advanced tech development and green concerns (Digest, 2024).

Stakeholder Collaboration

Another fundamental concept in APM is known as effective stakeholder collaboration. Information exchange with the stakeholders always happens during daily scrum meetings, as well as during sprint reviews and retrospective meetings, which is crucial to make sure that all the stakeholders are on the same page with the overall goals and to assess whether the project meets their needs daily. It creates regular engagements that help in the inclusion of stakeholders in the various decision-making processes that affect the project, making it more transparent to the intended projects. This synergy is especially important in The Line project, with various partners, including government agencies, vendors of technology solutions, and city planners, to ensure that the project reflects the innovative and sustainable idea that has been developed.

Iterative Progress and Continuous Improvement

Due to the iterative process of APM there is gradual improvement and value growth at all stages of the process. Sprint is a chance to deliver a functional increment of the project and create value in sequences thus enabling a constant delivery of value. It is used to minimize risk and guarantee that even if the project is faced by other challenges in the middle of the project's cycle, useful output will be delivered at frequent intervals. For The Line project, this implies that sectioned parts of the smart city model can be established and fine-tuned without collapsing the whole to prevent cascading issues and instead come up with improvements in series.

Risk Management

APM also improves risk management as it is a flexible process that can be planned on a large scale and then implemented in stages. APM makes it possible to divide large projects into smaller pieces so that any risks can be easily identified before the project proceeds with its work at large. Sprint reviews and retrospective will allow for addressing such problems immediately and before they amplify into significant ones (Gillis et al. , 2023). This proactive approach in managing risks is critical in the Line project since the building is a smart city that is composed of several systems that must work efficiently for the desired performance.

Performance Metrics and Feedback Loops

APM also involves goals and controls, whereby measures of work output and feedback mechanisms are used. While using techniques like burndown charts and velocity charts help teams track the progress of a project and work more effectively. These metrics help facilitate supervision today and are vital for keeping the project on track as well as accountable. By incorporating performance measurement indicators, there will be a way of determining the level of implementation of smart technologies in the smart city, measures put in place towards sustainability, and factors relating to stakeholder satisfaction (Holdsworth & Holdsworth, 2023).

In conclusion, Agile Project Management can be considered a solid approach to organizing and conducting big and innovative projects such as The Line. The principles of flexibility, stakeholder engagement, incremental progression, and constant enhancement are

also intrinsic to the context of smart city projects because this field is characterized by high levels of susceptibility to change and novelty. With the ability to support adaptive planning, improve stakeholder relations, and encourage iterative development, APM can play a decisive role within the development of The Line to achieve its objectives and target smart city projects.

Indicators of Progress in Agile Project Management

Stakeholder reviews, frequent feedback loops, and the continuous delivery of project increments are how Agile Project Management gauges progress. Important metrics consist of:

- Iteration Reviews: Evaluation of work completed at the conclusion of every sprint or iteration. By doing these evaluations, you can make sure the project is moving forward and accomplishing its goals.
- Burndown charts: Monitoring the quantity of work finished in relation to the quantity yet unfinished. These graphs show development in a visual format and aid in locating any bottlenecks.
- Customer Feedback: Consistent feedback from relevant parties to guarantee adherence to project objectives. This feedback loop guarantees that the project can adjust to new requirements while being customer focused.

Implications for Enhancing Smart Sustainable City Initiatives

APM practices can be used to bring positive changes to SSCI goals as the application of flexible planning, incremental development, and constant improvement mechanisms. When applied to the context of The Line project in KSA, it will further support the deployment of smart technologies as well as the incorporation of sustainable and innovative practices to meet the future needs of the proposed smart city. The principles of APM are in line with the objectives of developing a sustainable environment in cities; thus, can be applied effectively in the context of smart city challenges.

Adaptive Planning

Another strength of APM lies in its feature on adaptive planning. Unlike other methods of managing projects which tend to be slow, static, and long-term, APM supports work in shorter cycles with frequent reviews of objectives and tactics. This approach is more useful for smart city projects which must continuously change due to progress in technology and changing needs in urban environments. As demonstrated in The Line project, it is called adaptive planning that adapts to implement new technologies and solutions when they are available to maintain the idea of an innovative city (VirtualSpace, 2023).

Iterative Development

Another aspect of the APM's development approach is incremental, where the project is divided into smaller incremental cycles or sprints. At the end of each sprint, a review is conducted to assess the progress and the activities to be corrected or adapted are discussed. This facilitates sustained delivery of functional project sub-products with resultant early

identification and correction of problems. Based on the concept of ‘The Line’, iterative development enables the progressive integration of smart technology and the physical environment within the project while minimizing the potential for major failures at each stage of development. This method ensures that the project can readily adapt to opportunities and challenges that exist in the market, thus being able to meet the needs of all stakeholders at every stage of the development process (Wrike, n.d.).

Continuous Improvement

It is an integral strategy guided by the standards of APM that encourages the evaluation of project work and its continuous enhancement. In its approach, APM focuses on reflecting on the previous sprint and providing continuing feedback and incremental improvement based on the results of its performance measures. Within the prospect of the operational line concept of The Line project, the principle of Kaizen means that sustainability and innovation are constantly being developed and improved. This approach is vital to the concept of a smart city, enabling it not only to satisfy the population’s immediate demands but also to prepare for future challenges that cities will face (Rashidy, 2023).

Collaboration and Stakeholder Engagement

APM underlines interaction with other people, thus, project management according to the APM approach implies high levels of activity involving other people. Meeting with the stakeholders daily through stand-up meetings, sprint reviews, and retrospectives helps to meet stakeholders’ needs and expectations. This fosters transparency that helps in building trust, besides achieving intended project objectives that meet stakeholder needs. Engagement of the stakeholders in line project greatly is crucial for developing a smart city which will effectively and efficiently support the inhabitants of the city as it will involve the government, technology companies, planners and citizens among others (10 Principles of Stakeholder Engagement | APM, n.d.).

Improved Project Transparency

Therefore, the adoption of APM in The Line project can have positive effects such as enhanced project visibility with up-to-date information and platforms. Transparency tends to support stakeholders in monitoring project progress, decision-making, and providing feedback when needed. This visibility assists in developing confidence among stakeholders, thus ensuring that they remain committed in the project life cycle (Hidalgo, 2019).

Increased Stakeholder Satisfaction

The motivation towards incremental value and the ability of the APM to align with stakeholder demands results in higher stakeholder satisfaction. Through stakeholder engagement in the planning and development process and showing that the needs of the stakeholders have been considered, APM ensures that what is implemented within the project meets their expectations and needs. In terms of The Line project, it marks the formation of a

smart city that would be more appropriate for the needs and desires of its inhabitants and other stakeholders involved (Conforto et al., 2016).

Enhanced Risk Management

APM improves risk management by enabling one to address any risks that may be present at a very early stage. The values of flexibility and learning nature of the iterative approach mean that risks can be evaluated several times to return to a better point where corrections can be made, thus the chances of experiencing serious disruption are minimized. As the process of smart city formation often unveils new challenges and uncertainties in the middle of its execution, it is crucial to keep managing risks and to prevent possible disturbances of the project (Márquez, 2022).

Coordination and Adaptability

Conventional smart city projects such as The Line involve the integration of various systems into a single infrastructure that is malleable to the daunting challenges that comes with city development. APM allows the establishment of organization projects and various project components and different project stakeholders to have direction on their work and effort to prevent lack of co-ordination and inefficiency. Particularly when it comes to developing smart cities, such a dynamic knowledge and information processing approach is vital in terms of technology inclusion as well as addressing sustainability challenges (Márquez, 2022).

In conclusion, the considered approach to project management – Agile Project Management benefits can be depicted as considerable to strengthen the implementation of smart sustainable cities. Overall, adopting the key principles contained within APM immediately enhances the intelligibility and coherence of smart city initiatives and affords an effective approach for navigating the inherent challenges and risks of these projects. By using the ideas of APM in The Line project, the areas of project transparency, satisfaction of the stakeholder, and risk could be the potential benefits for the success of creating a livable, efficient, and resilient city context.

Conclusion

The expansion of project management methodologies has been helpful as it assisted in solving issues that are caused by the growth of large-scale projects. However, among all these methodologies, there is one that is ideal for large and visionary initiatives like The Line in Saudi Arabia – The Agile Project Management (APM) as it focuses on the frequent cycles and stakeholders.

The essential tenets of Agile Project Management (APM)—adaptive planning, iterative development, continuous improvement, and collaboration—align perfectly with the requirements of smart city initiatives. One advantage of APM is that, supporting frameworks can be easily incorporated which will enable projects to adopt sustainable practices and new technologies within a short span of time in response to changing demands of urban societies and technological advancements. Although APM is cyclical, it is easier to deliver working project components in a steady manner, so that an iterative process can be used to refine the project and to also identify problems early. Combine this with multiple feedback and co-decision making and not only do you minimize risk, but you also ensure that the project is right in sync with stakeholder perceptions.

When applied to The Line project, it reveals how APM contributes to championing smart sustainable city initiatives. With the help of increased transparency, satisfaction of the involved stakeholders and improved recognition of the risks, APM becomes a cause of emergence of the livable, effective and sustainable urban habitat. Since MOR is interactive, or more specifically, time-variant, it allows for management of intricate aspects of projects, as well as adaptability – that is an essential requirement when addressing the issues that arise with the formation of smart cities.

Concisely, by adopting APM techniques in The Line project it sets the blueprint for the other smart city projects to come globally while addressing the needs of current aggressive city development. The study's conclusions demonstrate the importance of APM in handling the difficulties of smart city projects by providing a workable framework for environmentally and technologically flexible urban development. This study highlights the value of agile approaches in developing creative, resilient, and sustainable urban environments, offering a model for future large-scale infrastructure projects with comparable objectives.

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