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Application Portfolio Management Maturity:

A Grounded Theory investigation on the processes and expected
benefits

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Abstract

Most of the major anticipated benefits of Application Portfolio Management (APM) are not seen until the later stages, making it difficult for enterprise architects and other members to explain benefit realization of APM to the stakeholders. This study investigates the problem using maturity models to provide a roadmap of expected benefits for the organizations. Firstly after an extensive literature review, 3 maturity models were selected and analysed to create a maturity model best suited for the context of this study. This model based on theory was further improved by giving it a practical background. To achieve this, semi-structured interviews were conducted with various stakeholders of APM from the XYZ company. These interviews were analysed using *the Grounded Theory approach* and the results were used to improve this model. Finally, a survey was conducted to evaluate how this model performs as a maturity model. The result of this was an elaborate 5-stage maturity model complete with management processes, benefits a checklist of items to indicate the level of maturity. This maturity model can be used by organizations as a roadmap to realize the benefits of APM and to provide an overview to the stakeholders.

Keywords: Application Portfolio Management (APM), Maturity Model, Enterprise Architecture, Benefit Realization, Management Processes

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A thesis, much like a treasure hunt, is a quest filled with challenges, triumphs, and the occasional bout of caffeine-induced enlightenment. I've ventured in, armed with wit and a keyboard, to uncover the secrets of APM.

"Benefit Realization for Application Portfolio Management: The Quest for the Realization of Benefits" – as epic as it sounds, this thesis journey has been one for the books, and it wouldn't have been half as entertaining without the incredible cast of characters who contributed to this saga.

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And now, as Gandalf would say, "The thesis is passed, and the scholar becomes the master."

To all the future graduates, in the grand tradition of quirky acknowledgements, let's remember that

"the journey of a thousand citations begins with a single footnote" .
(Confucius, probably)

So may the force (of citations) be with you all!

Nilay ;)

Peace out!

About The Organization

Due to confidentiality reasons, the company in the research will be kept anonymous and be addressed as Company XYZ.

This research is done in collaboration with one of the largest food and beverage companies in the world. The company has over 36000 employees spread across more than 40 countries.

The enterprise architecture team of the XYZ company started the implementation of the Application portfolio management module. Based on the dashboards in the company, data seen in ServiceNow and after considering the feedback from the Enterprise Architecture(EA) team(7.2), it was observed that the expected benefits of Application Portfolio Management were not seen. This lack of benefits realization was noticed on several levels.

At a practical level, there were several missed opportunities in making data-driven decisions, This was because many data fields and the links between many of the data tables were not defined, and this created significant challenges in terms of getting insights.

At a more strategic level, the Information Portfolio which is designed to help companies retrieve information and track information flows was not being used, this resulted in missed opportunities for better management and utilization of information resources. Technology Portfolio which provides a timeline view of the IT assets and is used to manage application life cycles was also not used.

Thus it was realized that the APM module was not being used efficiently at its full potential which in turn meant that XYZ was not yet getting the full benefits that APM can provide. It is crucial to give stakeholders clear information about the timeline for reaping the benefits of application portfolio management in order to ensure their support. Without a clear understanding of when the benefits can be anticipated, stakeholders may fail to see the value of APM.

Thus the company decided to support this research.

1

Introduction

As companies grow, they naturally incorporate new business processes that require IT application support. With the number of applications in organisations reaching thousands, application portfolio management (APM) has become crucial. However, as indicated by McKeen & Smith [31], despite its potential benefits, APM has been difficult to fund in many organizations because implementing APM often requires significant investments in new tools, technologies, and human resources, as well as the involvement of various stakeholders across the organization; Even after funding has been received, it is still a management challenge. Some benefits are seen during individual activities, but most of the major benefits are anticipated benefits until all processes of APM have been implemented [31]. A clear roadmap to achieve these benefits doesn't exist. This in turn also makes it difficult for enterprise architects and other IT leaders to convince and explain the value of APM to the stakeholders.

This report addresses the aforementioned challenges by considering various aspects of APM such as maturity, stakeholder involvement, and benefit realization. To gain a comprehensive understanding of application portfolio management in organizations and address the challenges, a systematic literature review was performed. The methodology employed to define the search queries, selection of exclusion criteria and assess the retrieved literature, is detailed in the appendix. The selected literature was then reviewed to provide a theoretical background encompassing the main concepts surrounding APM, thereby elucidating the state of the art of the topic. In this review, topics such as Application Portfolio Management, Project Portfolio Management, Enterprise Architecture, Maturity Models etc. are discussed along with the relationships between them. This can be found in Chapter 2.

Notably, the literature review shows a gap in existing maturity models: the existing maturity models don't delve deep into benefits realization at different levels of maturity and do not elaborate on the management processes, this gap observed in the literature was also observed at the XYZ Company. To ensure stakeholder engagement, they need to have a clear understanding of the timeline of the expected benefits so that they don't fail to see the value of APM.

1.1. Research Questions

As previously mentioned in the *About The Company* Section, once the APM initiative implementation began, the enterprise architect team found it important to clarify the benefits of APM and when to expect them. This would help in strategic planning of the future landscape. It was conveyed by the enterprise architects that an overview of the benefits expected at each stage of APM would help address this issue. Furthermore, it was also necessary to develop an approach to assess the degree of institutionalization of APM in the organization.

General Research Problem: Challenges in institutionalizing APM while managing benefits realization in Organizations.

To tackle the research problem described above, the scope was narrowed to the context of Company XYZ and the following general research question was defined to provide a narrower direction to this research:

General Research Question: *How can the Application Portfolio Management Process be presented to facilitate the organizations to achieve the expected benefits of APM?*

This question can be further divided into the following sub-questions-to further narrow the scope of this research:

- *Which benefits & processes must be present in a model to help organizations manage their application landscape?*
- *How can the proposed model be improved to better fit the needs of a company like Company XYZ, using insights from expert APM Practitioners?*
- *How can such a model be operationalized in a company like Company XYZ to assess its level of APM maturity?*

The answers to these questions will provide an organization with a roadmap to increase the maturity of their APM and thus help realize the benefits of APM. The sub-questions will help guide the research to delve deep into the management processes, benefits and the maturity of APM. The outline provided below in Figure 1.1 provides an overview of this document. Chapter 2 presents the maturity model developed by combining the maturity models in literature and after improving it based on interviews and surveys, Chapter 5 presents the proposed maturity model as the final result of this research. These two chapters hold the answers to the 3 subquestions and thus answer the main research question.

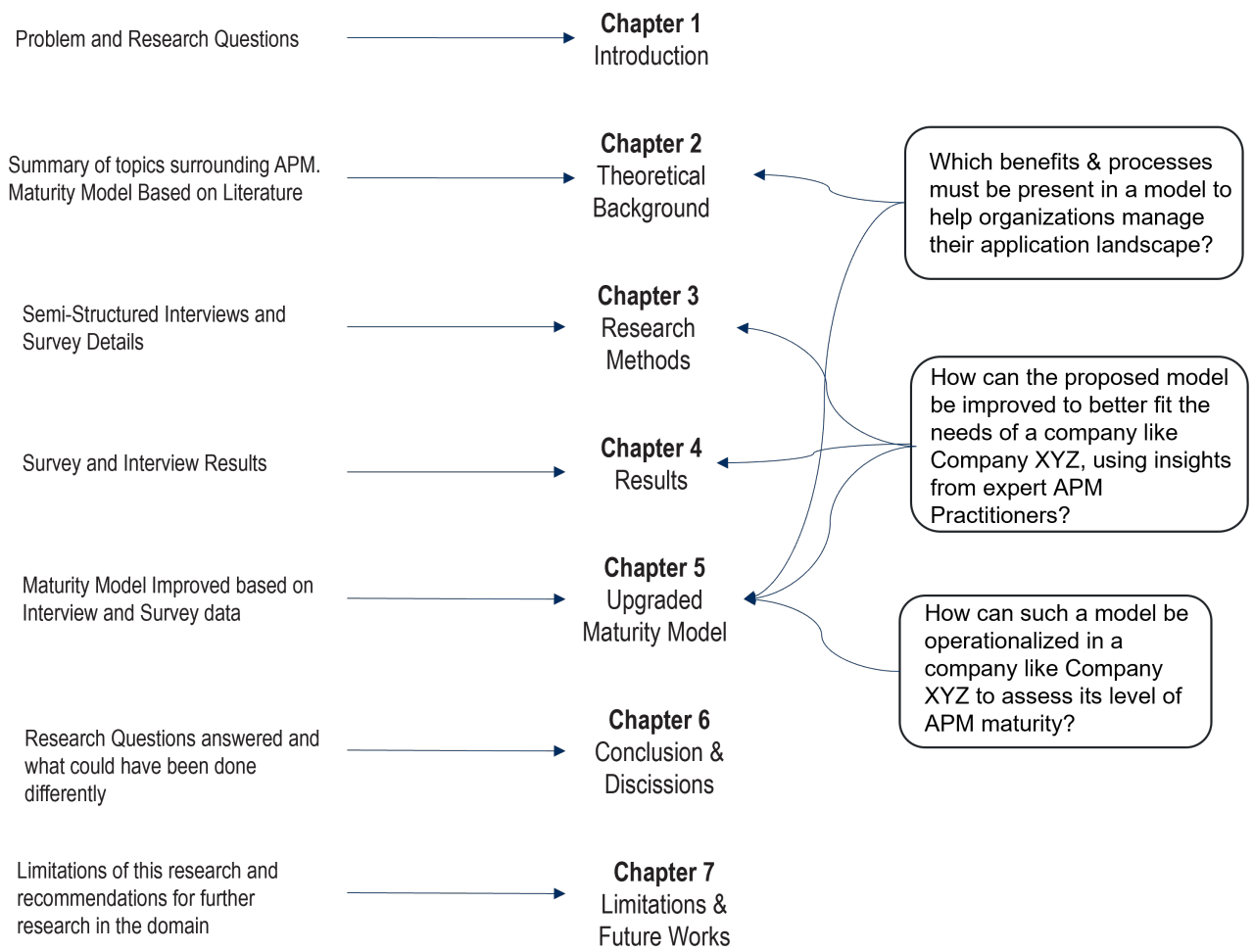


Figure 1.1: Report Outline

2

Theoretical background

This Chapter presents the results of the systematic literature review which was conducted at the initial stages of this research. The parameters for the reproduction of this review can be found in Appendix A (7.2). This review aimed to capture the state of the art on Application Portfolio Management and related topics. We discuss Application Portfolio Management, Enterprise Architecture, Project Portfolio Management, IT Portfolio Management, Stakeholders, Information Models, Maturity Models, Benefits, challenges and KPIs, after which a summary of the relationships between all these concepts is also presented.

2.1. Application Portfolio Management

A report from 2022¹ indicates that companies - on average - will use more than 1000 applications to support their business processes in 2023 [3]. Such a large number of applications makes it harder to implement, integrate, operate, and further develop applications to support business processes [40].

According to Kovácsné [25], the software needs of a company can be categorised as Strategic, High Potential, Key Operations and Support. Here, Strategic applications are applications that are crucial for daily business and to achieve goals, High Potential applications are the applications that support specific business areas such as 'Research and development', Key Operations applications refer to applications on which the company depends for success i.e. improve performance, integrate, avoid duplication etc. and finally Support applications are applications that are valuable but not crucial for business.

The applications of a company together with the relationships between them is called Application Landscape [4][15][16]. Managing this landscape is one of the most essential practices of IT Governance [14], irrespective of the company's size [17]. This governance practice is also known as Application Portfolio Management (APM), which can be defined as the ongoing management process of categorization, assessment, and rationalization of this IT application portfolio [31]. Due to the high importance of APM, over the years there has been a lot of research which in turn led to numerous definitions of APM. It started as a matrix-based portfolio approach, classifying applications along specific dimensions and deriving appropriate management action and investment allocation [46] and was first

¹MuleSoft's 8th annual Connectivity Benchmark Report, in collaboration with Vanson Bourne and Deloitte Digital, was produced from interviews with 1,050 IT leaders across the globe

introduced in 1981 [30][46]. The definition has since evolved numerous times, Riempp and Gieffers-Ankel [40] use APM to refer to all models, methods and guidelines applied by IT decision-makers for the assessment, management, and optimization of an AP, and then proceed to give different viewpoints such as IT strategy, business and application needs, IT architecture, IT operation, IT project management, and IT investment for decision-making. Kovácsné and Mozsár [33] describe APM as a way to understand IT costs, achieve savings with resource optimizations and define what the roadmap is for the changing with IT technologies. In 2010 McKeen and Smith [31], compared APM to a financial portfolio before making IT investment decisions and in 2012 Simon and Fischbach [45] considered APM as a network of applications and then suggested using network analysis to support it. In [51] APM is also defined as the first step to cloud migration. The literature offers many views about what exactly APM is, a timeline of all of these definitions can be seen in Figure 2.1.

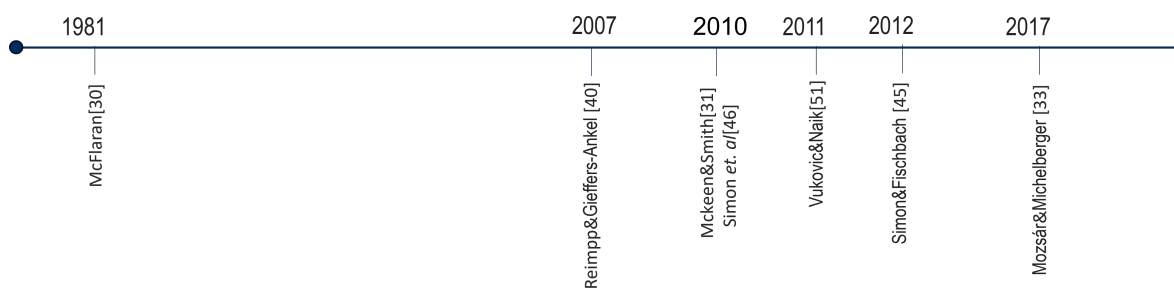


Figure 2.1: Timeline of APM definitions

However as also observed by Simon *et al.* [46], a few points that most of the authors seem to agree on are as follows:

- APM is not a one-time effort, but an ongoing process.
- It is a structured and systematic process with distinct phases.
- Basic rationale behind APM is reducing application landscape complexity.
- APM should provide a holistic portfolio view, which includes, cost, technical health, life-cycle, etc.

Based on this literature review, **the term Application Portfolio Management in this research is defined as the management of the application landscape of an organization to reduce complexity, improve efficiency and achieve cost savings by considering factors such as costs, technical health, and life-cycle**

2.2. Enterprise Architecture, Project Portfolio Management and ITPM

The necessity for APM and other Enterprise Architecture(EA) endeavors can be attributed to the increasing complexity of the modern application landscape [46][40]. Enterprise Architecture(EA) is defined as the organizing logic for business processes capabilities and IT infrastructure, to address the integration and standardization requirements of a company's operating model [41][42]. Tam *et al.* [49] also defines Enterprise Architecture in a similar

fashion while also emphasising on the interrelationships between the Business Processes and IT systems, and the extent to which these systems are shared between different parts of the enterprise. It is also worth noting that Enterprise Architecture is not only intended to support IT development but must also help to identify inconsistencies between product specifications, performance indicators/goals, business process specifications, informational structures or informational flows, application design, IS functionalities, and other architecture artifacts [8]. Buckl *et al.* [11] observed that Enterprise Architecture experts consider APM as a process in Enterprise Architecture Management(EAM), and then proceeds to state that APM is closely related to Project Portfolio Management as the selected project portfolio determines that development of application portfolio in the next cycle. The link between APM and PPM is bi-directional i.e. potential applications must be evaluated against existing applications and vice versa [12]. It must be noted that the Project Portfolio Management approach can not be the same as the Application Portfolio Management approach, 'Project' has a limited lifespan and the decisions are one-offs, however, most decisions and benefits of APM are reoccurring [21]. Project Portfolio Management and Application Portfolio Management together form IT Portfolio Management(ITPM) [9][12]. IT Portfolio Management is defined as an approach that can be applied to an entire portfolio of activities with the purpose of establishing a balance between expected risk and expected return from IT [22].

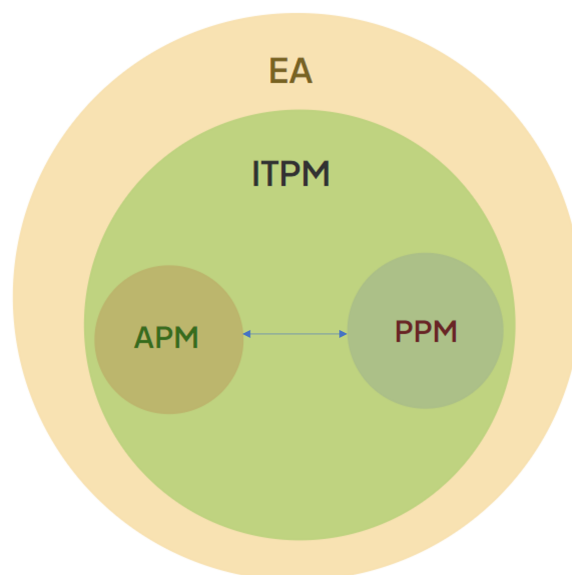


Figure 2.2: Relationship between APM,PPM,ITPM and EA

Based on the reviewed literature, Figure 2.2 shows the relationship between Application Portfolio Management, Project Portfolio Management, IT Portfolio Management and Enterprise architecture.

2.3. Stakeholders

For effective management of these portfolios, stakeholder involvement is regarded as an important practice [40]. Involving key stakeholders when designing application strategy

and ensuring that the entire process of APM is closely monitored and aligned is key to the success of APM [17]. Typical stakeholders include senior management such as CIO, CTO etc, Project/Program Managers, Enterprise Architects and software architects [39], Raadt *et al.* [39] further categorised these stakeholders by their organizational levels and aspect area as seen in Figure 2.3.

Table 1
Key EA Stakeholders, their aspect areas and organizational levels.

	Business	Information	Information systems (IS)	Technical infrastructure (TI)
Enterprise	CEO, CFO, COO Board of Directors	CIO	CIO	CTO
Domain	Head of BD/BU Business change manager	DIO IT change manager	DIO IT change manager	Platform manager Platform subject matter expert
Project	Business project manager Business analyst	Information analyst	Software development project manager Software designer/architect	Infrastructure project manager Infrastructure engineer
Operational	Operational business manager Business process administrator End-user	Database administrator End-user	Application management Application administrator End-user	Data center management Infrastructure administrator

Figure 2.3: EA Stakeholders [39]

Even though the active participation of these EA stakeholders is considered one of the main success factors, it was observed that many of the stakeholders are reluctant to take part in the process [39]. This reluctance was further tied to the satisfaction level of the stakeholders by Raadt *et al.* [39], who define a link between the effectiveness of EA to stakeholder satisfaction. Which adds to the significance of this research.

2.4. Information Models

These stakeholders depend on information and documentation to manage current and plan future landscapes [4]. According to a survey [29] conducted by the authors of [11], information about the landscapes must be stored in a tool. In [11], they further claim that having an information model of the application landscape is an important requirement in APM. The information on these application portfolios must be defined and maintained in a consistent EA model, which not only considers the information about the applications but also the relationships between them [10]. Buckl *et al.* [11] also defined the requirements for such information models, for any information model to be applicable to landscape management it must:

- **R1:** contain a ternary relationship in order to support analyses regarding current and future business support (which business processes are supported by which business applications at which organizational units),
- **R2:** provide the possibility to specify envisioned business support providers in order to facilitate target landscape planning without having to specify implementation details of the business support,
- **R3:** support the deduction of future landscapes from the project tasks, which execute the transition from the current to the future business support,

- **R4:** ensure the traceability of management decisions by storing historic information of past planning states, which may be interesting especially if complemented with information on the rationale for the decisions,
- **R5:** foster the creation of landscape variants based on distinct project portfolios in order to tightly integrate project portfolio management activities, and
- **R6:** allow impact analyses regarding dependencies between different projects, which affect the same EA elements, e.g. organizational units, business applications, and business processes.

These information models provide a structured approach to maintaining and managing information in a consistent fashion. However, it is also crucial to understand the degree of institutionalization of APM and ITPM as a whole. Therefore to get an indication of how far the APM process has progressed, Maturity Models come into play.

2.5. Maturity Models

Maturity Models are important because not only do they help practitioners in implementing APM processes but also equip researchers with a framework to guide future research initiatives [6]. Most of these maturity models are based on the Capability Maturity Model(CMM), which was introduced in the early 90s for software process maturity [35].

Simon *et al.* [46] define APM maturity as a measure of how far the APM process has gone and the extent to which APM, and ITPM as a whole, are institutionalized as ongoing approaches. Simon *et al.* [46] also presents a six-stage maturity model for APM, which can be seen in Figure 2.4.

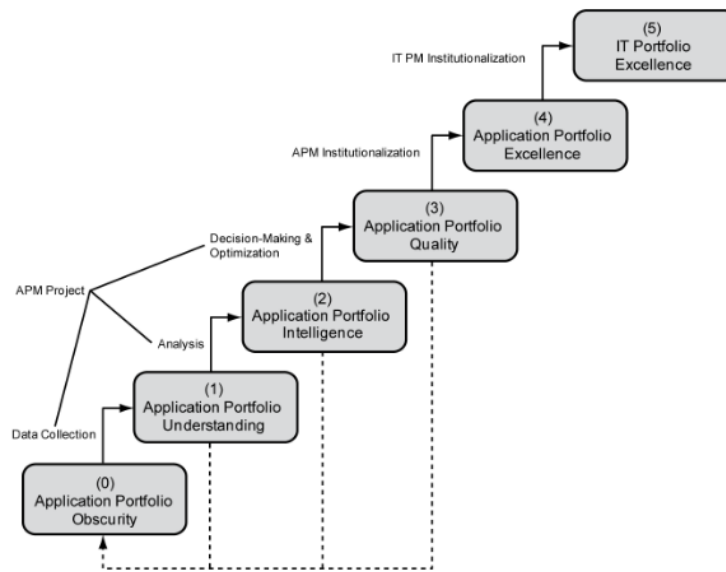


Figure 2.4: Maturity Model by Simon et. al. [46]

Here **Level 0: Application Portfolio Obscurity** is the starting point for many organisations, at this stage, no APM has been implemented. To move to **Level 1: Application Portfolio Understanding** data about the application portfolio has to be collected, at this stage, a

documented application inventory is created. Analysis of this documented application portfolio leads to **Level 2: Application Portfolio Intelligence**, which is related to the capability to analyse the portfolio. **Level 3: Application Portfolio Quality** is a result of decision-making and optimization based on level 2. **Level 4: Application Portfolio Excellence** is reached by creating a defined APM structure with distinct roles and responsibilities and institutionalizing the APM process, this stage ensures systematic decision-making for future application investments. Simon *et al.* [46] also suggests a **Level 5: IT Portfolio Excellence**, in which ITPM as a whole is incorporated.

This maturity model is also used by Zelt *et al.* [54] to differentiate between the maturity levels for the Outsourcing strategy.

Jeffery and Leliveld [18] presented a Maturity Model for IT Portfolio Management as a whole. This Maturity Model only has 4 stages: ad-hoc, defined, managed and synchronized. This model can be seen in Figure 2.5.

Factor	Maturity Stage		
	Defined	Managed	Synchronized
Advanced Valuation			Inclusion of qualitative option value in funding decisions; monitoring of project's earned value in deployment.
Feedback Mechanism			Feedback on IT alignment with strategy — score cards evaluate each project.
Benefits Measurement			Tracking of project benefits after project development is complete; measurement of IT value through the full project life cycle.
Active Portfolio Management			Understanding of risk and return — portfolio weighted accordingly.
Strategic Alignment		Annual review sessions between business-unit heads and IT to discuss IT and strategy alignment.	Frequent review sessions with business unit to discuss strategy alignment (quarterly or monthly).
Financial Metrics		Use of financial metrics in prioritizing: NPV, ROI, IRR.	
Demand Management		Well-defined scheme for screening, categorizing and prioritizing projects; portfolio-management approach to rank projects for investments.	
Centralization	All projects in one database; all IT spending tracked centrally and rolled into one database; centralized project office monitors projects.		Use of portfolio software — real-time updates on portfolio modifications, performance and health.
Standardization	Applications and infrastructure are well defined and documented.	IT portfolio segmented by asset classes — for example, infrastructure, strategic projects.	

Figure 2.5: Maturity Model by Jeffery & Leliveld [18]

Here, **Ad-Hoc** stage refers to having no APM process. At **Defined** stage the major elements of the company's IT portfolios have been identified and registered, along with an estimate

of the costs and benefits of each component. However, at this stage companies still struggle to have a visible Business IT alignment. Companies at **Managed** stage have a standardized Portfolio Management approach with a clear link between Business and IT. Finally, at the **Synchronized** stage companies use metrics to measure lifecycle, routinely retire and employ new applications and projects. IT efforts here are aligned with the business strategy.

Comparing these two models by Simon *et al.* [46] and Jeffery and Leliveld [18] we see significant overlap in these models, First stages in both the models i.e. **Level 0: Application Portfolio Obscurity** and **Ad-Hoc** refer to a state where no Portfolio management process is in place. **Level 1: Application Portfolio Understanding** and **Defined** refer to a defined inventory of all portfolio elements. **Level 2: Application Portfolio Intelligence** is used in the first model and **Managed** in the second model to refer to a state where a clear link between Business and IT is identified and the portfolio is ready to be analysed. **Level 3: Application Portfolio Quality** is missing in the model by Jeffery and Leliveld [18] where the model skips to the **Synchronized** stage which is similar to **Level 4: Application portfolio Excellence** and **Level 5: IT Portfolio Excellence**

Another factor to be considered when talking about maturity is the IT budget. Ross [41] provides an overview of how IT budget gets affected by changing the level of maturity, IT budgets also need to adapt to different stages of maturity, in the initial stage IT budgets are high because of various factors such as limited purchase agreement opportunities, sharing of technical expertise, etc., IT spending decreases as we move to the later stage as hardware and software processes and data standards are introduced. However this decrease is only temporary and the spending again increases in the next stage, even though this might seem discouraging, it can be justified as a company starts gaining greater strategic benefits from IT.

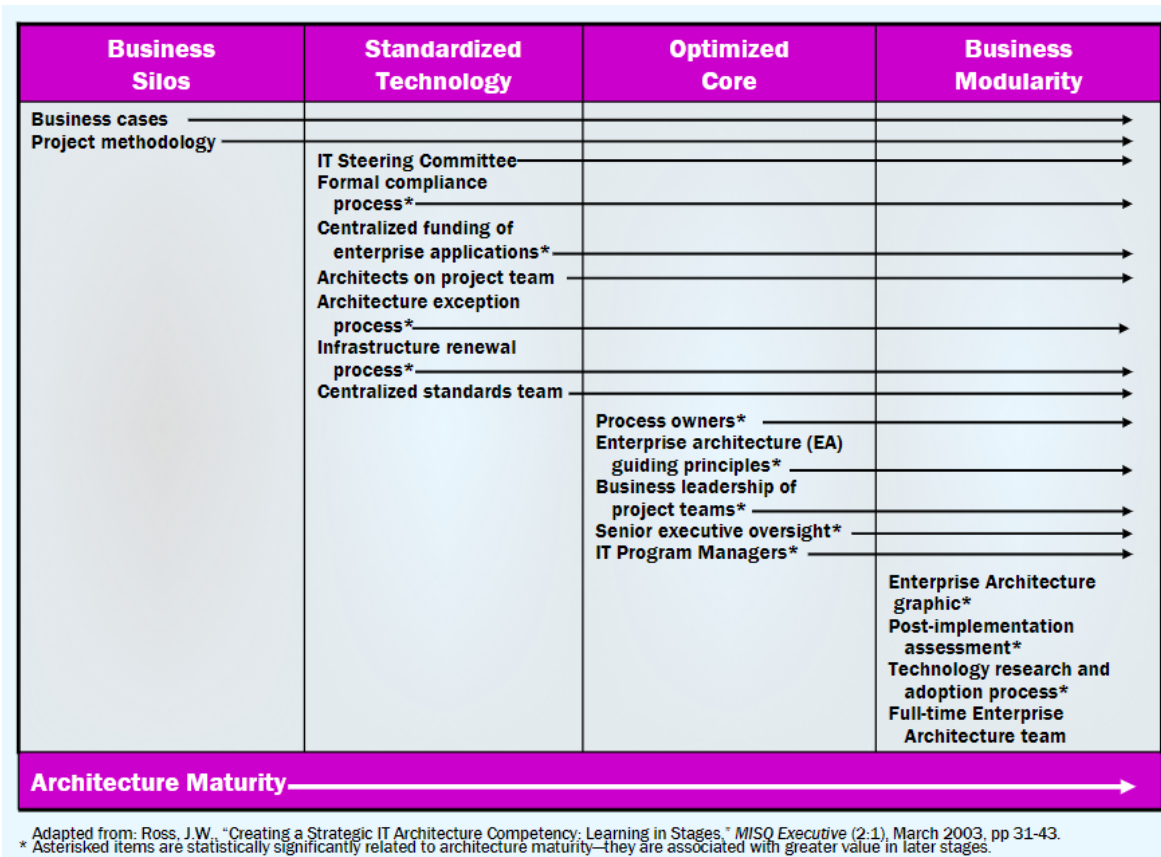


Figure 2.6: Maturity Model by Ross [41]

A four-stage EA Maturity Model with management practices to gain value from IT was presented by Ross [41], where the four stages are: Business Silos, Standardized Technology, Optimized Core and Business Modularity. This can be seen in Figure 2.6. Companies cannot skip stages in this Maturity Model because each stage requires both technological and organizational changes that prepare the company for the next step [42].

This model is different from the other two models as this focuses on the management practices that must be implemented at each stage to gain business value from the implemented IT, this model is important because just having invested in IT and building IT capabilities may not be enough to drive value from them certain management practices must be implemented [41]. A mix of these mature practices will lead to a better Business IT alignment [14]. In [42], this model is used by the author to define a guide for outsourcing based on level of maturity, three forms of outsourcing are defined: strategic partnership, co-sourcing alliance, and transaction exchange. The author suggests that companies transitioning from Level 1 to level 2 to can use **Strategic partnership**, companies going from level 2 to level 3 can benefit most from a **Co-Sourcing Alliance** and companies making a transition from level 3 to level 4 would benefit from **Transaction Exchange**.

2.6. Benefits

One of the things the literature seems to agree on is that most of the benefits of Application portfolio management are not seen until later stages of maturity have been reached [46][18]. Application portfolio management has many benefits, some of them are commonly mentioned in the literature [31][25][18][33][21] and are mentioned below:

- **Increased Cost-Savings:** APM reduces IT spending by helping identify and retire redundant or legacy applications, providing clarity over maintenance and support spending thus reducing unnecessary IT maintenance costs etc.
- **Reduction in complexity:** Need for application portfolio management is driven primarily by increased complexity [46].
- **Identify Business Critical Applications:** APM helps identify business-critical applications by creating an inventory of applications which can be assessed for risks and business impact analysis can be done.
- **Business-IT alignment:** APM can improve business-IT alignment by identifying redundant applications, and by evaluating application costs to prioritize IT spending.

Other than these commonly occurring benefits, APM also comes with benefits such as business strategy alignment, improved customer service, efficient IT integrations during mergers/acquisitions, better outsourcing, improved security, better decision-making, and the ability to map investments to business objectives [40][54][18][9][12]. Tam *et al.*[49] suggests the idea of looking at the benefit enablers such as Organisational Alignment, Information Availability, Resource Portfolio Optimization and Resource Complementarity instead of the benefits themselves and proceed to state that businesses with a high level of standardization and integration can expect to see most benefits. Expected benefits can then be mapped to these enablers, examples of these are also presented in [49]. Here, some of the benefits enabled by Organisational Alignment include: reduced rework, identifying and resolving conflicts, more customer intimacy etc. Information Availability enables benefits such as improved decision-making, improved information flow, better prioritization of systems etc. reduced resource duplication, reduced cost, simplified maintenance, higher ROI etc are enabled by Resource Portfolio Optimization. Finally, Resource Complementarity enables benefits such as improved performance, strategic agility etc. This approach helped map the benefits to the management processes and thus to the maturity levels.

2.7. Challenges and Risks

While Application Portfolio Management provides many benefits, some potential challenges and risks must also be considered. APM introduces a significant management challenge and also requires a commitment of considerable organizational resources [31]. Traditional approaches used for data collection at the initial stages of application portfolio maturity tend to be expensive, time-consuming, tedious and error-prone [51]. Angeren *et al.* [6] found that most non-IT executives are found to be indifferent with regard to APM, and in a survey, Jeffery [18] observed that almost half of the respondents agreed that IT staff lacks knowledge of financial concepts, this points to a skills and resources challenge. In the same survey [6], 82% respondents identified the ability to estimate benefits as a major challenge in

organizations. The literature also agrees that, while some benefits can be realized at each stage, most benefits of APM are not perceived until later stages when all of the capabilities have been developed [46][18]. Mcfarlan[30] states, failure to achieve anticipated benefits as a major risk. The benefits are difficult to measure and some of them often cannot be measured financially [52][46]. Bischoff *et al.*[7] identified that Enterprise Architects struggle to justify the value of EA to the stakeholders. Narman *et al.* [34] also states that realizing the full value of the Application Portfolio often proves to be elusive. Companies can very easily lose sight of the value created by IT investments due to a lot of factors such as pressure due to increasing competition, customer demands, and cost management. While the authors above mention different aspects of the factors that impede the perception of benefits of APM, they agree that it is challenging to discern the value of APM. This adds to the relevance of this research.

Companies also seem to struggle with application retirement. Respondents in a survey, Howery *et al.* [17] indicated that it is often easier to make a business case for acquiring or building an application than to retire it. Moreover, the article [17] also presents key barriers to application retirement which are: the cost of retirement projects, lack of immediate ROI, company culture and behaviour, differences between regions, lack of qualified developers to migrate retired application data and functions, some companies also just do not consider retirement a priority. These legacy applications not only reduce competitive advantage but also increase security risk [9].

In addition to the challenges above, several risks must also be looked at. A lot of the literature agrees on having some form of risk management concurrent to traditional APM [32][24][33]. Most of the risk factors such as stakeholder resistance, poor documentation, and poor application analysis can be categorised into the following areas Finance, Policy/Culture, Methodology, Organization, Technology, Strategy/Governance [46].

2.8. Key Performance Indicators

Companies will inevitably face various risks and challenges that can impact the performance and success of their portfolio. However, companies can adopt effective Key Performance Indicators to acquire insights and assess the health of their portfolio to make informed decisions about mitigating these risks and overcoming the challenges. Kosroshahi *et al.* [23] presents 3 key performance indicators to analyse application portfolio health which can be seen in Figure 2.7

<i>Application Landscape KPIs</i>		
<i>Complexity</i>	<i>Quality</i>	<i>Impact</i>
Number of interfaces	Application failure	Operating costs
Capability coverage	Number of incidents	Number of users
Application age	Incident processing time	Business impact
Technology diversity		Strategic relevance
Deviation from standard		

Figure 2.7: Application Landscape KPIs [23]

Based on this reviewed literature a summary diagram was created to show relations between these topics identified in the literature surrounding the domain. After this, a Discussion Section is also added.

2.9. Summary

A summary diagram was made to reflect on the literature review. The diagram in Figure 2.8 summarises the relationships between the concepts studied in this literature review.

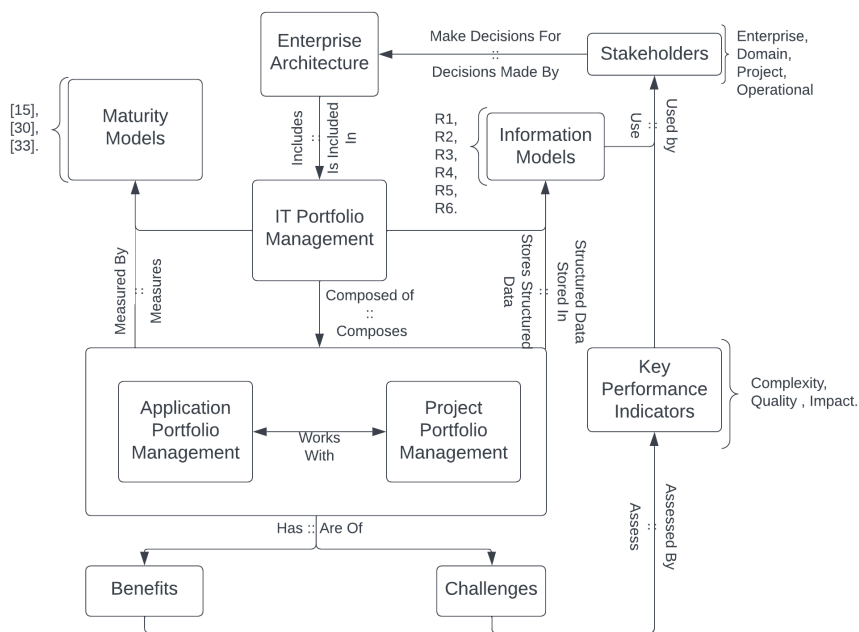


Figure 2.8: Summary Diagram

It was observed that IT Portfolio Management is a part of Enterprise Architecture and is

composed of Application Portfolio Management and Project Portfolio Management. APM and PPM work closely with one another and have benefits and challenges that can be assessed by Key Performance Indicators. Information Models are used to store structured data, and this structured data and the Key Performance Indicators are used by stakeholders to make EA decisions. Maturity Models are used to measure how far the process has progressed.

2.10. Discussions

In this review, a total of 48 peer-reviewed articles were analysed to identify and understand the concepts related to APM such as EA, PPM, ITPM, Maturity models, Information Models, stakeholders, KPIs etc., and a panoramic view of these topics was also developed. Various definitions of APM were reviewed and analysed after which a definition was presented. EA, PPM, and ITPM were defined and a simple ontology showing how they are related to each other was presented. Stakeholders and their categorization were also discussed followed by a brief discussion of Information Models.

Three Maturity Models were reviewed. When reviewing Maturity Models, it was observed that all three have their strengths and weaknesses. Even though the Maturity Model defined by Jeffery and Leliveld [18] is the most cited/used, the Maturity Model defined by Simon *et al.* [46], presents more steps and is more elaborate with the levels of maturity, it was also integrated into a framework for APM. However, both of these fail to mention the management practices that must be in place at each level of maturity to move to the next step, which is done by Ross [41]. Except for the model defined by Jeffery and Leliveld [18] the other two Maturity Models fail to include benefit realization at all and Jeffery and Leliveld [18] also only include benefit measurement factor at the final stage of maturity. As discussed earlier in the review, one of the key challenges is a lack of perception of benefits.

Therefore this research proposes an investigation of the aforementioned Maturity Models to find or define a Maturity Model for benefit realization in the XYZ Company, One of the world's biggest food and beverage companies.

An in-depth analysis of the maturity models was performed to develop a maturity model based on theory, after which management processes and benefits expected were mapped to each level of maturity to give a timeline view of the expected benefits, this proposed theoretical model can be seen in Figure: 2.9.

2.11. Maturity Models from Literature: Features Combined

As discussed in the previous section, all of the three maturity models by Simon *et al.* [46], Ross [41] and Jeffery and Leliveld [18] have their strengths and weaknesses. The maturity model by Simon *et al.* had the most number of maturity levels which allows the model to be more elaborate. Taking inspiration from this the proposed maturity model also has 5 levels of maturity. The first two levels i.e. **Application Portfolio Obscurity** and **Application Portfolio Understanding** align with the first two levels of the maturity model by Jeffery and Leliveld [18], in which they are defined as **Ad-hoc** and **Defined**. The names for the Maturity levels 1 and 2 seem to be more self-explanatory and therefore were used in the proposed maturity model. The 4th level of maturity in the model by Simon *et al.* [46] is better defined by Ross [41]. Based on the analysis of these 3 models it was also observed that a loop of

continuous improvement is also crucial to stay at a higher level of maturity, therefore, when a company reaches excellence, it must keep going to the optimized level in a continuous loop to stay at a higher level. Thus as a combination of the best of all 3 models, the combined maturity model has the following 5 Levels of maturity:

- Ad-hoc Management
- Application Portfolio Defined
- Application Portfolio Intelligence
- Application Portfolio Optimized
- Application Portfolio Excellence

After deciding the maturity levels, the management practices and processes from all of the maturity models were analysed and mapped accordingly to the 5 maturity levels in the proposed maturity model. The management processes can be seen in the table 2.1.

Table 2.1: Management Processes for APM Maturity Levels

Maturity Level	Management Processes
Adhoc	Initiate data collection
Defined	Analyze and create dashboards to generate insights, Applications and infrastructure well defined and documented In a standardized APM Tool, categorize the Application portfolio into business capabilities
Intelligence	Create an IT Steering Committee, Formal demand management process, Define and use metrics, Centralized funding for Enterprise applications
Optimized	Initiate Cloud Migration, Data-driven decision-making and optimization, EA Guiding principles, Strategic planning of future landscape
Excellence	Understanding risk and return to integrate in decision making, Business-IT alignment, Real-time updates on health scores

The maturity levels were described based on these management processes and the observations at the company.

Benefits of APM discovered during the literature review 2, were then mapped to each level of maturity based on the management processes that provide those benefits. The final maturity model developed as a result of this can be seen in Figure 2.9.

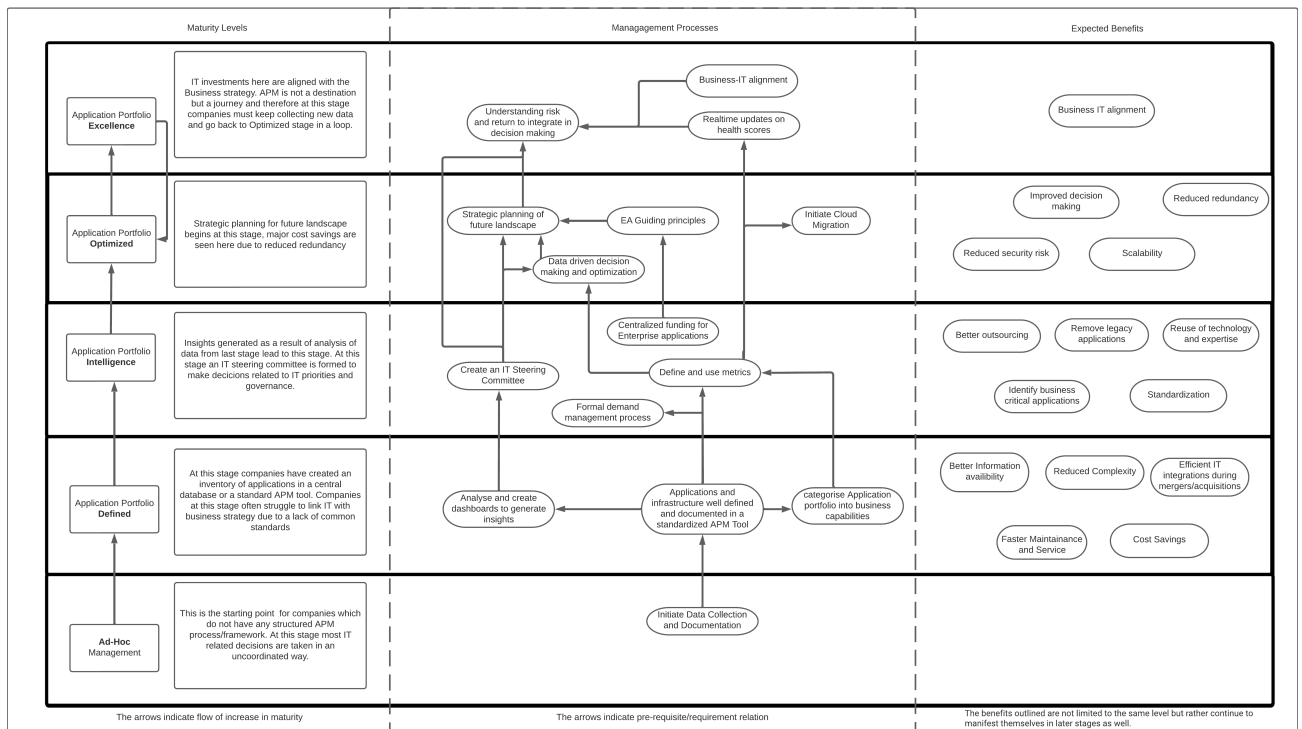


Figure 2.9: Maturity Model based on theory

3

Research Methods

The main research question and the sub-questions can be answered by creating a maturity model and mapping the anticipated benefits to each level of maturity. However, creating this model just based on the theory would not be enough. This is because while theoretical literature helps define the underlying principles and concepts that guide the research, empirical/practical insights help build a comprehensive understanding of the topic at hand.

A comprehensive research methodology was employed in this research, which consisted of semi-structured interviews as well as a survey. The combined output of these interviews and surveys provided insights into the practicality and effectiveness of the proposed maturity model. In this Chapter, we delve into the research methods, discussing the interview and survey processes in detail.

3.1. Expert Interviews: Model refinement

The interviews were conducted with the purpose of refining and improving the model based on insights from industry experts. Details about these interviews are presented below, categorised into the data collection instrument used, the participants interviewed and the procedure itself.

3.1.1. Data Collection Instrument

Semi-Structured Expert interviews were conducted over Microsoft Teams to evaluate and improve the model by gathering expert insights and perspectives about the proposed maturity model for APM. As seen in Figure 2.9, the model is divided into 3 parts: The **maturity levels and descriptions**, **Management Practices**, and the **Benefits**. To cover the whole model the semi-structured interviews also focused on these 3 broad categories. Additionally, other soft aspects of the model such as the strengths, weaknesses, usefulness etc were also discussed. The complete list of topics discussed in the semi-structured interviews is as follows:

- **Maturity levels and descriptions** : Participants were asked to provide feedback about the maturity levels and the definitions and descriptions of each level. This helped assess the clarity and completeness of the descriptions as well as ensure their alignment with the APM process.

- **Benefits and KPIs** : The interviews explored if the benefits were appropriately mapped to the maturity levels and how they can be measured. This provided insights into the alignment between the benefits and maturity levels to ensure the accuracy of anticipated outcomes at each level.
- **Management processes and transitional moments** : The accuracy of management processes and mappings was assessed at all levels and Participants were also asked about the transitional moments that would indicate the readiness to mature into a higher level. This would help validate the management processes and enable realistic transitions between levels. This also helped develop a checklist that indicates an increase in maturity.
- **Usefulness of the model** : The overall perceived usefulness of the model was also evaluated in the interviews. Participants were asked to share perspectives about the applicability of the model in the real world to improve decision-making.
- **Potential challenges in Implementing the model** : Participants were asked to identify potential challenges an organisation might face when implementing the model. This was done with the aim to highlight crucial considerations and to help address the barriers.
- **Strengths and Weaknesses** : To get an understanding of the merits and potential areas of improvement the participants were also asked about strengths and weaknesses.
- **Opportunities for future research** : Participants were finally asked about where the future research surrounding APM maturity models could expand.

During these interviews PowerPoint slides were used during the interviews to provide direction and add a certain depth and clarity to the discussion, thus allowing participants to provide targeted feedback. The insights generated from these interviews helped gain valuable feedback to improve the proposed model as well as enhance its validity. The interview findings, along with the evaluation survey discussed in a later Sub-Section contribute to the overall comprehensive assessment and refinement of the model.

3.1.2. Participants

The participants were selected at the XYZ Company with the aim of ensuring a diverse range of perspectives covering all aspects of APM. The participants were the stakeholders of APM who were chosen, making sure to include all Domain, Project and Operational aspects surrounding APM at the XYZ Company. Interviews were also conducted with 2 of the total 4 VPs at the company who are directly involved with APM or related areas. All of these added up to 13 expert interviews, each with a different area of expertise.

Title	No of Interviewees	Area of Expertise
Enterprise Architects	4	Technical Capabilities and IT strategy, Integrations and Master Data, Functional Areas and Cyber Security
Solution Architects	2	ERP and DigITize, Strategy analytics and transformation
Team Representatives	5	Software Asset Management(SAM) Team, Change Team , Cloud Team, Security Team, Project Portfolio Management(PPM) Team
VPs	2	IT strategy architecture and governance, Technical Capabilities

By involving participants with diverse expertise and seniority, it was ensured that the interviewees covered all aspects of APM, encompassing varying opinions and insights about the model.

All of the participants were required to sign an Informed consent form to show their consent to participating and being recorded etc. Additionally, they were also verbally made aware of this at the beginning of each interview.

3.1.3. Procedure

A total of 13 interviews were conducted for this research from the 15th of May to the 2nd of June 2023. Initial communication and documentation were conveyed via email to keep the interviewees informed and increase the credibility of the insights generated. An introductory email was first sent out to all the selected participants(As mentioned in Sub-Section Participants above), this email provided an overview of the thesis research and informed them of their potential involvement. A small PowerPoint presentation was also attached to this email communication, which summarized the problem statement, research questions and proposed methodology. Participants were also informed about the second email that they can expect at least 2 weeks before the interview date, which would include the proposed maturity model, a description of the maturity levels and topics to be discussed during the interviews. The email and the ppt can be found in the appendix.

Informed consent forms were also attached to request participants' approval for recording the interviews, confirm the willingness of participants, inform them of their right to not answer any question etc. This consent form can be found in the appendix.

One-hour individual interviews were then scheduled with the participants taking into account their availability. The interviews followed a semi-structured approach to achieve flexibility while also covering the key topics surrounding the model. A crucial thing to note here is that the first interview was conducted as a pilot with a solution architect, which provided valuable insights that helped improve and refine the remaining interview sessions.

During the interviews, the participants were requested to discuss the proposed maturity model, levels of maturity levels, management processes, benefits and associated topics such as benefits, challenges, strengths weaknesses etc in depth. These interviews were recorded to ensure accurate data collection for analysis and participants were also informed about their consent rights.

Some of the interviews had to be rescheduled due to participant unavailability or technical issues. One of the interviews had to be excluded due to a lack of relevant information.

Analysis

These interviews were then analysed using Grounded theory as discussed by Wolfswinkel [53] and the model was refined/improved. We started by making an informed choice of using Microsoft Teams as a meeting platform for these interviews, the need for this was two-fold, firstly as these experts were internationally located meeting in person for these interviews was not an option, secondly Microsoft Teams allows automatic transcriptions of the meetings which are crucial for the data analysis. The next step in this analysis was to ensure data accuracy, for which video recordings of all the interview meetings were carefully reviewed to find any errors or mistakes in the transcription. The analysis process started at this stage using the grounded theory approach, thus focusing on 3 major stages, Open Coding, Axial Coding and Selective Coding.

During the open coding phase, the interview data was examined to identify and categorize the interview transcripts. The goal was to gain a comprehensive understanding of participant's views about the proposed model.

In the axial coding stage, this data was further organized into structured categories based on the identified topics/themes. The following categories were identified: Maturity level and description, benefits, Key Performance Indicators, Management Processes and transitional requirements, Usefulness, strengths, Weaknesses, challenges for implementation, Opportunities for further research and other related topics. This allowed for a more systematic analysis of participants' responses.

Finally, in the Selective Coding phase, the output of the analysis was determined by finding underlying relations in the data to identify the core category of "Maturity model refinement". This main theme ties together the identified topics and their impact on the model.

To summarize, we started out with the initial topics that formed the framework for the semi-structured interviews. As we progressed through the coding process, more detailed topics were discovered. Thus we went from a standard list of topics to a more detailed elaborate list. This can be seen in detail in the results along with the participant's insights for each of these topics.

Thus by using the grounded theory approach, the analysis successfully captured the diverse perspectives and insights shared by the participants in the interviews. These findings provided valuable contributions to the development and refinement of the proposed maturity model aligning it with real-world challenges.

3.2. Expert Evaluation Survey: Model evaluation

The purpose of this survey was to provide a platform for expert evaluation of the model as a maturity model.

3.2.1. Data Collection Instrument

Salah et al. defined a template for evaluating maturity models by expert review [43], which was operationalized using google forms and sent out to the industry experts. This evaluation

template can be seen in Figure:1 in the Appendix. This was done to ensure that all of the relevant aspects of the proposed maturity model were examined by the industry expert participants.

This template presented in [43] consists of a domain expert evaluation form that covers various aspects of maturity model evaluation related to the completeness, simplicity, understandability, ease of use, operationality, efficiency, impact on the environment and users, as well as validity, reliability, flexibility, implementability, correctness, and relevance of the model.

The survey consisted of a total of 20 questions and was divided into 2 sections. The first part asked participants to select the degree of agreement with statements related to maturity levels, processes and practices, the maturity model, usefulness and practicality. The possible responses were Strongly agree, agree, neutral, disagree, and strongly disagree. The second section consisted of ten short answer questions, each focusing on specific aspects of the maturity model. Participants were asked to provide any potential additions or updates to the model's levels, descriptions, processes and practices. Additionally, they were also asked to talk about the scoring scheme, assessment guidelines, and overall usefulness and practicality. These questions allowed the participants to share elaborate insights and criticisms. These questions were phrased in such a way that if the participants answered 'NO' then it would indicate a positive response.

3.2.2. Participants

The participants of this survey were the same group of participants involved in the interviews. This was because of their expertise in APM and familiarity with the proposed maturity model, which allowed them to provide informed insights into the survey while ensuring that the feedback and evaluations were based in practical knowledge and experience. Details about the participant's roles and areas of expertise can be seen in the Participants sub-section for the interviews.

The survey procedure could not be finished by 2 participants, however valuable insights and feedback were successfully collected from the other 11 participants.

3.2.3. Procedure

The survey was created using google forms based on the **maturity model expert evaluation framework** [43]. This survey aimed to assess the quality of the proposed model as a maturity model. An email conversation was shared with the participants who had previously participated in the interviews to inform the participants about the evaluation survey and request their feedback, this email can be found in the appendix. To ensure maximum participation, two reminders were sent out to the participants, each with an interval of one week with the purpose of providing gentle prompts for those who were yet to complete the survey. These reminders encouraged participation and improved the response rate thus improving the credibility of the survey.

Analysis

To assess the internal consistency and reliability of the survey responses, Cronbach's alpha was calculated [1]. This measure is widely used to measure internal consistency.

Cronbachs Alpha	Interpretation
> 0,9	Excellent
> 0,8	Good
> 0,7	Acceptable
> 0,6	Questionable
> 0,5	Poor
< 0,5	Unacceptable

Figure 3.1: Cronbachs Alpha Value Interpretations

The responses from the first 10 single-select questions were used for this calculation. The obtained score was 0.96¹, which indicates an excellent internal consistency level. The value of this ranges between 0 and 1. For the survey to be considered acceptable this score must be more than 0.7, and anything above 0.9 is considered excellent and therefore indicates that the questions were consistent. The value interpretations can be seen in Figure 3.1.

¹<https://datatab.net/statistics-calculator/reliability-analysis/cronbachs-alpha-calculator>

4

Results

The major results from both the survey and semi-structured interview are presented in this chapter, and the practical results that directly translate into changes in the model are presented in Chapter 5.

4.1. Semi-Structured interviews

The analysis of the interview transcripts provided insights to improve the model. These findings were categorized into the following topics which emerged during the grounded theory approach. These key findings are presented below:

- **Maturity Level and Description:**
Some participants suggested improvements in the descriptions of the maturity levels of the proposed models and also provided specific feedback on each level. This feedback highlighted the importance on clarity and accuracy of the descriptions. To warrant a comprehensive representation of the levels, they emphasized the need to avoid overlaps.
- **Benefits:**
Here the participants suggested adding more benefits to the excellence level. Participants also recommended some changes to the mapping of some of the benefits. Additional feedback emphasised the significance of many of these benefits.
- **Key Performance Indicators:**
The discussion around the selection of these KPIs was around identifying the relevant KPIs to measure the anticipated benefits at different levels. Participants suggested various different KPIs for benefits at all levels, which included: Balanced scorecards, Net promoter scores, metrics for data quality, Lean principles, time etc. It was also acknowledged that the selection of these KPIs should align with the organizational objectives and context therefore they are not one size fits all.
- **Management Processes and Transitional Moments:**
Here participants focused on the mapping of the management processes and discussed the processes in detail such as the importance of including representatives from all areas in the IT steering team. The transitional moments between these levels were also discussed. This helped form the checklist for the transitions.

- **Usefulness:**
The participants acknowledged the usefulness of the model and described it as an important roadmap to guide the APM process. The ability of the model to align the process with the realistic expectations of benefits was underscored.
- **Strengths:**
The model an ability to provide a holistic view of the APM process along with the benefits was considered a strength
- **Weaknesses:**
The participants discussed a few of the major weaknesses such as a need for deeper dive into the processes and an absence of a timeframe to provide an indication as to how much the expected time for transition between the levels.
- **Challenges in implementation:**
Some of the challenges in implementing this model in practice were also discussed. Resource allocation was discussed as a major challenge as APM can be quite resource-intensive, engagement of employees was also considered a challenge along with education and change management which are challenges for the implementation of any new system. Lastly, the need for prescriptive metrics was also discussed.
- **Opportunities for further research:**
Participants expanded on the challenges and weaknesses discussed to provide insights about future recommendations for research. They discussed topics such as the expected time for transitioning between maturity levels, drilling down into processes, best practices for successful APM implementation, and exploring the impact of staying at the optimized level. This is further discussed in detail in Chapter 7.
- **Other related topics:**
Participants also discussed piloting this model into certain areas of APM instead of looking at APM as a whole. The importance of better communication using this model was also discussed along with exploring the enablers and requirements for each level, and indicated that the change management team must be involved in this effort.

The feedback and insights from these interviews provided directions to refine and enhance the model.

4.2. Survey

Based on the responses of the 11 participants the following key findings were derived for the first set of questions.

- **Maturity Levels:**
The majority of the participants strongly agreed that the maturity levels were sufficient to represent the entire maturation process of Application Portfolio Management and that there wasn't any overlap detected in the maturity levels(8 Strongly Agree).
- **Processes and Practices:**
The participants had a general agreement with the relevance of the processes and practices to APM(4 Agree, 6 Strongly Agree).
More than half of the participants strongly agreed that the processes and the practices covered all aspects relating to APM(6)

- **Maturity Model:**

Participants indicated a clear understanding of the maturity levels(9 strongly agree and 2 agree)

The participants also either agreed or strongly agreed that they understood the provided assessment guidelines, explanation and documentation.

- **Usefulness and Practicality:**

Most of the participants strongly agreed about the usefulness of this model in conducting assessments about APM maturity(8 strongly agree)

The participants also showed positive views about the practicality of the model for use in industry(6 strongly agreed and 4 agreed)

The remaining 10 short answer type questions provided additional insights about the maturity model evaluation. Many participants answered "no", which indicates that they do not think any changes were required with respect to the element discussed in the questions and therefore is a positive response. Many participants also left the short answer questions blank. This limited response pattern for the short answer questions in the survey can be attributed to the fact that the participants had already shared comprehensive insights during the semi-structured interviews.

In the limited responses for the short answer section, it was observed that the participants acknowledged the clarity, and relevance of the model, they also provided valuable feedback on potential areas for further research, such as incorporating numerical scores in the model and leveraging surveys to gather stakeholder views.

5

Upgraded Maturity Model

After the interviews and the survey, the proposed model 2.9 was updated to reflect the suggestions and insights from the data collected. This chapter presents the upgraded model while talking about the results that translate directly into practical changes in the model.

5.1. Improved Proposed Maturity Model

Several changes and additions were made based on the practical data, the improved model with these changes can be seen in Figure 5.1.

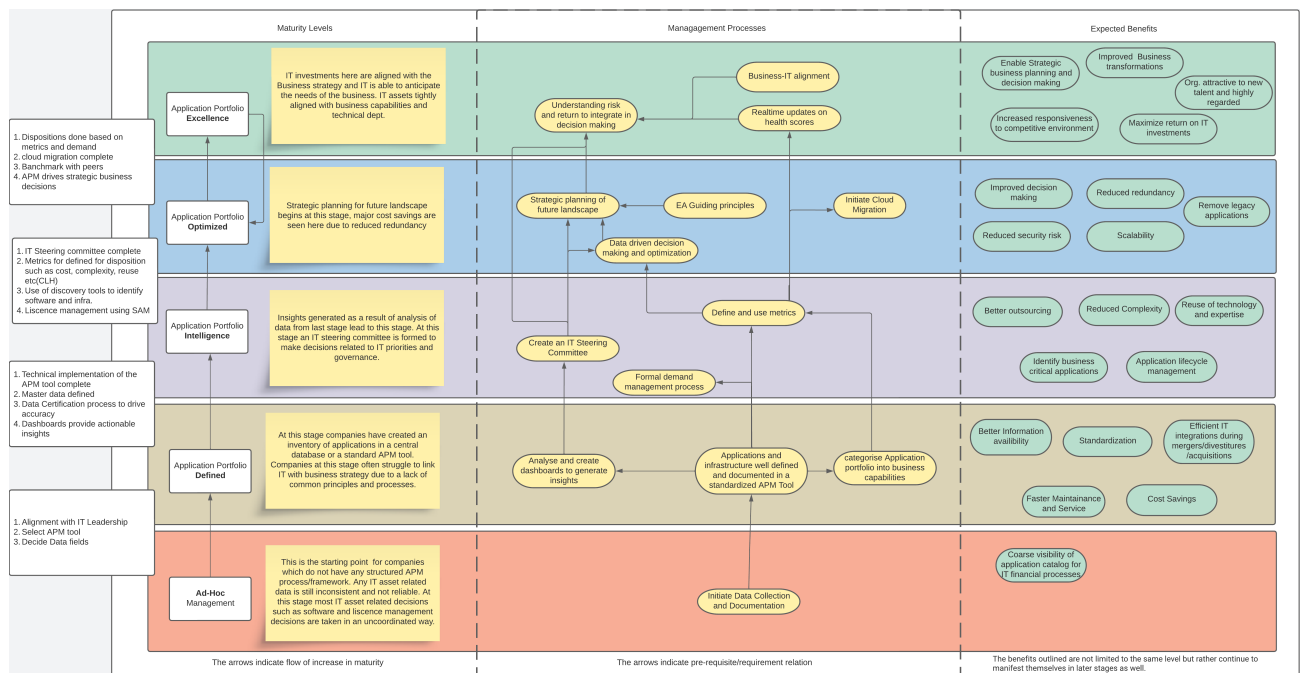


Figure 5.1: Improved Maturity Model

5.1.1. Comparison: Improvements and Changes

In the updated model, firstly the descriptions were changed based on the specific feedback from the interview participants. This change mostly involved rewording to better convey the underlying meaning of each of the maturity levels.

The participants agreed with the management processes, except for the centralized funding which was deemed unnecessary and out of place for the context of this model by 3 participants. Additionally, none of the participants talked about the importance of having this process in this context. This process was therefore removed. Along with this, 3 of the participants suggested adding some form of application lifecycle management process to the model and 2 suggested adding it at the intelligence phase, Therefore application lifecycle management was added.

A few major changes were made with respect to the mapped benefits. A total of 6 benefits were added at different levels of maturity and the association of 3 benefits was changed to different levels of maturity. As pointed out in the interviews, the ad-hoc maturity level should also come with some residual visibility of the application-related data. Thus the benefit, of *'Coarse Visibility of application catalogue for IT financial processes'* was added at the ad-hoc level. At the excellence phase, 5 new benefits were added. When the participants were asked about the transitioning moments between the maturity levels, 2 participants questioned whether we really want to move to optimized

"When we are already at optimized, transition to the excellence level is a question about 'Do we want to be the best in the class?'"

- Interview Participant

One of the VPs pointed out that people might not want to move to excellence because in this model some of the potential benefits of excellence are not mentioned which reduces the anticipated value of reaching that level. Some of the benefits that can be seen here as discussed by the participants are Increased responsiveness to the competitive environment, Improved business transformations, Maximized return on investment and Organization being more attractive to new talent and being highly regarded. All of these were added at the excellence stage, thus increasing the anticipated value of reaching that level. The benefit of BIT alignment was more specifically explained as *'Enable strategic business planning and decision making'*.

5.1.2. Checklist

Another major addition to the changes in management processes and the benefits is the added checklist. The purpose of this checklist is to provide a concrete indication of the maturity level. Participants were asked to rank the XYZ company's maturity on the proposed maturity level and it was observed that participants ranked the company at different levels based on their perception of maturity, therefore making it subjective and having varying opinions. To avoid this a checklist of items was created, completion of all items at a level would indicate an increase in maturity. The checklist for different levels of maturity as derived from the interview data can be seen below:

Table 5.1: Checklist for APM Maturity Levels

Maturity Level	Checklist Items
Adhoc to Defined	<ol style="list-style-type: none"> 1. Alignment with IT Leadership 2. Select APM tool 3. Decide Data fields
Defined to Intelligence	<ol style="list-style-type: none"> 1. Technical implementation of the APM tool complete 2. Master data defined 3. Data Certification process to drive accuracy 4. Dashboards provide actionable insights 5. Educating people about the model and APM
Intelligence to Optimized	<ol style="list-style-type: none"> 1. IT Steering committee complete 2. Metrics defined for disposition such as cost, complexity, reuse, etc. 3. Use of discovery tools to identify software and infrastructure 4. License management using SAM
Optimized to Excellence	<ol style="list-style-type: none"> 1. Dispositions done based on metrics and demand 2. Cloud migration complete 3. Benchmark with peers 4. APM drives strategic business decisions

Additional insights were also provided about the checklist items :

- **Alignment with IT Leadership:** Participants suggested that the IT leadership must be involved in the process at the initial stages to ensure their understanding and support throughout the process.
- **Selection of APM tool:** The company created a requirement list and conducted what they called a "beauty contest" between different service providers for APM such as LeanIX, ServiceNow, Dynatrace etc, this was to find the best fit for their needs. Finally, ServiceNow was selected as it aligned the most with the company's requirements. Some of these requirements were as follows, 1. The tool must integrate with the Configuration Management Database(CMDB)¹, PPM, and other required platforms 2. It must meet CMDB and APM functional requirements and 3. It must align with the cost objectives. The participants recommended that each company must create such a list before choosing the tool.
- **Decide Data Fields:** The data fields to be populated must be decided in these initial stages. At company XYZ, these data fields were decided and grouped into 6 categories: Identifiers, Ownership, Metrics, Change and Operations, Hosting, and Utilization. The Identifiers include the Name, Description and a unique Asset Tag/ID to identify the solution. The Ownership category is comprised of the application owner, IT support and business contact. The metric category covers the metrics to be calculated at later stages. The change and operations category involves the change approval group and the incident group to manage any incidents/problems. Hosting contains the Hosting

¹<https://uit.stanford.edu/service-management/toolkit/cmdb>

platform, Architecture type and SLA of the platform. Finally, the Utilization category has the lifecycle status, global impact/usage, and geographical area where the application is used.

- **Technical Implementation of APM tool complete:** At this point, the tool must be implemented in the organization. All technical capabilities may not be used at this stage, however, they must be ready to use.
- **Master Data Defined:** All the data fields should have definitions and they must be documented and accessible to all the stakeholders.
- **Data Certification Process to drive accuracy:** To make the data accurate, a data certification process must be created and a fixed schedule for this certification must also be in place. At company XYZ, a data certification cycle is run every quarter. This is to ensure that the insights generated from this data are trustworthy.
- **Dashboards provide actionable insights:** At this point, the company must begin creating dashboards. The XYZ Company had 3 major dashboards which included a Dashboard based on application data, a Server data dashboard and a dashboard for the data certification process.
- **Educating people about the model and APM:** Companies must educate the stakeholders about the APM process, and the maturity model used.

"Its better to story tell and explain the benefits and the process, than to just say 'do this, because I am making it your job'"

- Interview Participant

- **IT Steering committee complete:** The IT steering committee must be formed involving members/representatives from all aspects surrounding IT and business. They must have meetings at regular intervals with specific agenda items and make data-driven decisions.
- **Metrics defined for disposition such as cost, complexity, reuse, etc:** At company XYZ, the disposition decisions such as keeping the application, retiring the application or upgrading the application, they use the terminology *invest, tolerate or retire*. To make these decisions metrics are crucial and must be defined at this stage.
- **Use of discovery tools to identify software and infrastructure:** To automate the process of finding the applications and servers on the IT infrastructure of the company a discovery tool must be used, this automation will ensure efficiency while improving accuracy.
- **License Management using SAM:** Software Asset Management tool must be used at this point to start managing all the licences for the applications in the portfolio.
- **Disposition done based on metrics and demand:** The disposition decisions mentioned earlier must now be made with the metrics defined earlier while also considering the demand from the business.

- **Cloud Migration Complete:** The cloud migration process must be complete and all the applications and data that can/should be on the cloud should have migrated. The cloud migration project at XYZ Company is known as the *Skyway Project*.
- **Benchmark with peers:** At this stage, the company should start benchmarking its portfolio management process with industry peers, this will help identify best practices and areas of improvement. This will also help understand the position of the company as an IT organization in the industry.
- **APM drives strategic business decisions:** APM will start to influence and drive business decisions at this stage

6

Conclusion and Discussions

In this chapter, the findings of this research are consolidated. While highlighting the achievements of the study, we also critically evaluate the methodologies. The discussion not only reflects on the conclusions of this research but also opens avenues for future research using alternative approaches.

6.1. Conclusion

The research aimed to answer the research question by developing and proposing a maturity model and associating benefits to each level of maturity to help provide a timeline view of anticipated benefits. This study has successfully answered the research question by answering each of the sub-questions:

"How can the Application Portfolio Management Process be presented to facilitate the organizations achieving the expected benefits of APM?"

The sub-questions can be found in Chapter 1. A systematic approach was used to answer the questions. The first sub-question delved into using the existing models and adapting them to the specific context by picking the best of each model. To achieve this a literature review was done and 3 maturity models were evaluated to create the theoretical foundations for the proposed maturity model. The second sub-question focused on mapping the expected benefits of APM to different levels of maturity in the theoretical model. This created the maturity model based on theory, to further improve and evaluate this theoretical model and give it practical background, expert interviews and surveys were conducted.

Furthermore, recognising the need for practical applicability, a checklist was developed at each level to guide the organizations through levels of maturity. Completion of all items on the checklist at a certain level indicated an increase in maturity, this reduced the subjective nature of maturity perception.

This research offers a potential solution to the problem of benefit realization in APM. The proposed maturity model along with the mapped benefits, management processes and checklist provide a roadmap for organizations to improve the maturity of their Application Portfolio Management.

By integrating benefits mapping into this model, the study not only provides a clear trajectory for benefit realization as a practical contribution but at a theoretical level also

establishes a conceptual framework that links the attainment of benefits with the maturation of APM processes. This was not found in previous literature.

6.2. Discussions

The conclusion highlights how the proposed maturity model addresses the challenge of benefit realization in APM. However, it must be acknowledged that the problem could have been approached from various angles, even with methods that would not involve maturity models.

In context of this research, *Grounded theory* approach [53] was used to analyse the interview data and create a comprehensive understanding about the domain. Grounded theory approach, because of its inductive nature, allowed for emergence of insights directly from collected data. It facilitated the development of the proposed model based on the empirical reality.

However alternate methods such as *Design Science Research Methodology*(DSRP) [36] also seem promising for future research. As it focuses on creation and evaluation of innovative artifacts, such as frameworks and models. Applying DSRP to study benefit realization of APM could help development of new and innovative tools or strategies to address the challenge.

Even though the proposed maturity model serves as a framework to align the APM practices with the realization of expected benefits at different levels of maturity, it must be considered that the adoption of the proposed maturity model introduces a layer of complexity and interpretation. Depending on a company's ambitions and plans, the company might handle benefit realization using a custom process, or strategic initiatives. In such a case, a maturity model approach may not be considered. Instead, companies may choose solutions that better align with organizational goals or offer immediate benefits or are better suited to their context.

In conclusion, while the model presents an approach to address the benefit realization problem of APM, it is crucial to acknowledge that other methodologies may or may not have given the same results.

7

Limitations and Future Works

This chapter provides an overview of the limitations and future works surrounding this research. This chapter is divided into two sections starting with the limitations of the study followed by the recommendations for future research to help provide direction for further improvements and research about the Maturity model for Application Portfolio Management.

7.1. Limitations

The study proposed a maturity model to provide a timeline of expected benefits and has generated valuable contributions. However, as any research does, this study also has several limitations that must be acknowledged. The study was confined to a single organization which limits the diversity, scope and generalizability of the proposed model. Secondly, the grounded theory comes with an inherent perspective bias[2]. The approach of analyzing data collected using the grounded theory approach may introduce a bias in the coding and analysis process due to the researcher's interpretations. Another thing to consider is that the proposed model underwent expert evaluation, however, it was not practically implemented in the company. This was mainly due to time constraints, this research would be more suited for a longitudinal/multi-year study.

Recognizing these limitations is a crucial part of any research as it provides insights into the opportunities for further research.

7.2. Future Works

Several promising avenues for further research were discovered during this research. Firstly at a more strategic level, conducting extensive empirical research about the time taken to transition between the levels of maturity would be a valuable contribution, this could be done by interviews with companies that provide APM as a service to client organizations as they would have experience on how companies mature in APM. Additionally, exploring how the proposed model could be adopted or customized to fit the requirements of different industries and different sizes of companies would make it more generalizable. A recommendation at an operational level, also discussed by the participants was to define a way to operationalize the maturity model. This could involve repeated measures to see if the company's APM process is maturing. Additionally, future work could focus on ways to further operationalize the

checklist from Table 5.1. Some of the possible research avenues based on checklist items for research are presented below.

- **Alignment with IT Leadership:**

Future work focusing on Alignment with IT leadership could be about KPIs for measuring this alignment, the benefits of aligning with IT leadership or ways to improve the alignment. Additionally, it could also focus on who would be a part of IT leadership.

Knowledge Questions:

- How can the degree of alignment with the IT leadership be measured?
- What strategies can be used to engage and involve the IT leadership in APM?
- What are the key factors responsible for effective alignment?

Supporting Reference: [38]

- **Selection of APM tool:**

Research about tool selection could involve a deeper dive into requirement definition and organizational aspirations. Using the method from the key publication here as an example, a similar method can be adopted to define requirements for an APM tool.

Knowledge Questions:

- What are the specific functional requirements for an APM tool to fulfil the needs of the company?
- How can different APM service providers be evaluated to ensure that they align with the organization?

Supporting Reference: [11]

- **Define Data Fields:**

Defining data fields is one of the most crucial founding steps for an effective APM. Theoretically, the research about this could focus on something like requirement analysis, but the research could also be practical and focus on the standard data fields defined by organizations.

Knowledge Questions:

- How can the essential data fields be identified in the context of the company?
- What is the role of each of the data fields?
- What are the industry standards for data fields for APM?

- **Technical Implementation of APM tool complete:**

Here, potential research could focus on the implementation aspect of the tool and change management. However, it can also take another direction and focus on the capabilities of the tool.

Knowledge Questions:

- What are the potential challenges during the implementation of such a tool and how to overcome those challenges?
- What are the technical capabilities of the tool that must be implemented?

Supporting Reference:[50]

- **Master Data Defined:**

Master data can be defined as *"data about the business entities that provide context for business transactions"* ¹. Future work could focus on the definitions or master data management practice. Key publications present best practices and also a maturity framework for master data management.

Knowledge Questions:

- How can the master data be defined to ensure consistency and accessibility across the organisation?
- What processes must be in place to manage the master data?

Supporting Reference: [47]

- **Data Certification process to drive accuracy:**

Data certification is an important step for any organisation to maintain the credibility of the data. At the XYZ company, a gamification approach was used to ensure maximum participation. Key publications present a data quality assessment model and insights into the gamification approach that can be used.

Knowledge Questions:

- How often should the data certification cycle be conducted?
- What strategies can be used to ensure participation?
- What assessment criteria should be used to ensure the credibility of data?

Supporting References: [37], [48]

- **Dashboards provide actionable insights:**

Furthermore, the research could also be about the dashboards used to generate insights from the data. Key publications provide an in-depth overview and a checklist to guide the creation of such dashboards.

Knowledge Questions:

- How can dashboards be customized to meet stakeholder requirements?
- What are the key insights that can be generated from APM data to support strategic decision-making?

Supporting Reference: [19]

- **Educating people about the model and APM:**

Educating people is crucial to the implementation of any new system, therefore future research could focus on this. The change management team can help with this, the key publications talk about change management and challenges for this.

Knowledge Questions:

- How can an organization ensure adoption and understanding by all stakeholders?
- What are the challenges in educating people and change management, and how can they be avoided?

Supporting Reference: [44]

¹https://en.wikipedia.org/wiki/Master_data

- **IT Steering committee complete:**

Future works could also be about the roles and representatives from the IT Steering committee or the meeting schedule. Key publications give information about the effects of the IT steering committee in IT management and in realizing the effects of it on project management.

Knowledge Questions:

- What are the roles and representatives who form the IT steering committee?
- What measures/indicators can be used to check the effectiveness of the IT steering committee?
- What would be the Ideal meeting schedule for such a committee?

Supporting References: [28], [20].

- **Metrics defined for disposition such as cost, complexity, reuse, etc:**

In this, the research could be about what are the industry standard Key metrics and KPIs for APM or about the quantification of these. Potential literature provides KPIs for Application Portfolio management.

Knowledge Questions:

- What are the key metrics for making disposition decisions?
- How can these metrics be quantified?
- To what extent do these metrics support decision-making?

Supporting Reference: [23]

- **Use of discovery tools to identify software and infrastructure:**

Future work about Discovery tools could potentially go in several directions such as a dive deep into requirement analysis for such tools, or the validation of the data collection. Potential publications talk about one such tool from ServiceNow, which is used by the XYZ company.

Knowledge Questions:

- How can the requirements for a discovery tool be defined?
- What are the benefits and challenges of using a discovery tool to automate the application and infra identification?
- How can the data collected by such a tool be validated?

Supporting Reference: ServiceNow Discovery²

- **License management using SAM:**

License Management can help improve the effectiveness of IT governance and IT asset management. Future research could be about the integration of SAM with APM or requirement analysis for the SAM tool.

Knowledge Questions:

- How can SAM be integrated into APM for effective license management?
- How can the requirements for the SAM tool be defined to align with the organization?

²<https://docs.servicenow.com/en-US/bundle/rome-it-operations-management/page/product/discovery/reference/r-discovery.html>

Supporting References: [27], [5]

- **Dispositions done based on metrics and demand:**

Future research could also focus on the use of metrics for disposition-related decision-making. Gartner time model used by LeanIX for disposition decisions.

Knowledge Questions:

- How can metrics and demand be used to make disposition decisions?

Supporting Reference: LeanIX³

- **Cloud migration complete:**

Cloud migration is an important part of the optimization of the application portfolio. future research could focus on decisions about cloud migration and challenges. Potential key publications provide a deeper dive into the evaluation framework and challenges for cloud migration.

Knowledge Questions:

- How can availability be ensured while migrating to the cloud?
- What factors must be considered when deciding the applications to migrate?
- What are the potential challenges when migrating to the cloud and how can these challenges be overcome?

Supporting Reference: [13]

- **Benchmark with peers:**

By benchmarking with peer organizations, IT Organizations can compare and improve their practices and management processes. Key publications provide more information about using benchmarking as a measure of competitiveness.

Knowledge Questions:

- What KPIs must be considered when benchmarking?
- How can the APM process be improved to include benchmarking results?
- How can potential industry peers be selected for benchmarking?

Supporting Reference: [26]

- **APM drives strategic business decisions:**

A well-executed APM would help drive strategic business decisions, and the impact of this could be researched. Key publications provide information about using APM for decision-making. Knowledge Questions:

- How can the impact of APM on business decisions be calculated?
- How does APM support decision-making?

Supporting Reference: [40]

³<https://www.leanix.net/en/wiki/ea/gartner-time-model#TIME-model-quadrants>

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Appendix

Appendix A

A.1 Literature background

The fields of research were first identified, after which appropriate sources and specific search terms are defined. Finally, the criteria for selection were also decided.

Keywords and Search Terms

To gain knowledge about Application Portfolio Management, its benefits, challenges, Maturity Models and other related topics, this systematic literature review was done. With regards to this review, keywords were defined to find relevant literature which would help get a better understanding of the topic, these keywords were then grouped into 2 groups as seen below:

Group 1: APM and about APM

This group of Search strings was determined with the purpose of defining and understanding the concept of Application Portfolio Management. It includes keywords that were aimed at understanding the best practices and challenges associated with application portfolio management, as well as identifying the commonly used key performance indicators(KPIs) and the return on investment(ROI). Additionally, this group also included methods/frameworks and Maturity Models of Application Portfolio Management.

The keywords in this group were: Definition, Importance, Capabilities, Best practices, Challenges, Failure Points, KPI, ROI, Maturity, Method, Framework.

Based on these Keywords the following search strings were defined:

1. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Importan*" OR "Capabilit*" OR "Defin*"))
2. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Best Practice*" OR "Challeng*" OR "Fail*"))
3. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("KPI*" OR "Key Performance Indicat*" OR "ROI*" OR "Return on Investment*"))
4. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Matur*" OR "Method*" OR "Framework*"))

Group 2: APM in Context of

The second group of strings focuses on application portfolio management in the context of other related topics. This group focused on topics such as Enterprise Architecture, stakeholders, strategy, cloud migration etc.

The keywords in this group were: Enterprise Architecture, Cloud Migration, Service & Support, Stakeholders, Cost, Strategy

Based on these Keywords the following search strings were defined:

1. TITLE-ABS-KEY (("application Portfolio Management" OR "Application Landscape") AND "Enterprise Architect*")
OR
(TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Enterprise Architect*" OR "EA*"))
2. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Cloud*" OR "Cost*" OR "Financ*" OR "Service*" OR "Support*"))
3. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Stakehold*"))
4. (TITLE-ABS-KEY ("application Portfolio Management" OR "Application Landscape") AND ALL ("Strateg*"))

The search queries from both of these two groups resulted in a total of 839 results. Naturally many of these had to be excluded. To achieve this, selection criteria had to be defined.

Exclusion Criteria

A total of six exclusion criteria were defined to narrow down the results and to only include useful literature. A total of 48 literature items were selected at the end of this stage. If any of the Exclusion Criteria(EC) were true for a literature result, it was removed. These ECs can be seen in the table below:

#	Exclusion Criteria	Explanation
EC1	Literature Published before 2007.	The results on Scopus and Web of Science show a significant increase in publications in 2007.
EC2	Literature focus is irrelevant for the search term	Based on the Area of focus, the Literature is not related to the research area at hand.
EC3	Literature is not in English.	Literature in any other language is excluded.
EC4	Literature is a duplicate.	All duplicates are removed.
EC5	Literature are irrelevant.	Literature is not aligned with the focus area based on the title and abstract.
EC6	Literature is not reliable or has insufficient information.	Unreliable and/or insufficient information must be removed.

A.2 Expert evaluation survey

<i>Expert Information</i>					
Date					
Name (Optional)					
Organization/Institute					
Position					
Email					
Criteria	Strongly Disagree	Slightly Disagree	Neither Disagree Nor Agree	Slightly Agree	Strongly Agree
Maturity Levels					
The maturity levels are sufficient to represent, all maturation stages of the domain (Sufficiency)					
There is no overlap detected between descriptions of maturity levels (Accuracy)					
Processes and Practices					
The processes and practices are relevant to the domain (Relevance)					
Processes and practices cover all aspects impacting/ involved in the domain (Comprehensiveness)					
Processes and practices are clearly distinct (Mutual Exclusion)					
Processes and practices are correctly assigned to their respective maturity level (Accuracy)					
Maturity Model					
<i>Understandability</i>					
The maturity levels are understandable					
The assessment guidelines are understandable					
The documentation is understandable					
<i>Ease of Use</i>					
The scoring scheme is easy to use					
The assessment guidelines are easy to use					
The documentation is easy to use					
<i>Usefulness and Practicality</i>					
The maturity model is useful conducting assessments					
The maturity model is practical for use in industry					

- Q1. Would you add any maturity levels? If so please explain what and why?
- Q2. Would you update the maturity level description? If so please explain what and why?
- Q3. Would you add any processes or practices? If so please explain what and why?
- Q4. Would you remove any of the processes or practices? If so please explain what and why?
- Q5. Would you redefine/update any of the processes or practices? If so please explain what and why?
- Q6. Would you suggest any updates or improvements related to the scoring scheme? If so please explain what and why?
- Q7. Would you suggest any updates or improvement related to the assessment guidelines? If so please explain what and why?
- Q8. Would you like to elaborate on any of your answers?
- Q9. Could the model be made more useful? How?
- Q10. Could the model be made more practical? How?

Figure 1: Maturity Model Evaluation Template [43]

A.3 Meeting Notes

Meeting Notes

Master thesis Discussion Meet			
Team members present	[REDACTED]	Meeting date and time	17/02/2023 16:00 to 16:30
Purpose of the meeting	Discuss Thesis Progress and Direction	Type of meeting	MS-Teams

Key points

- *EAs struggle with proving the value of APM to the stakeholders.*
- *Hard to stay on course, as people stop wanting to invest as the benefits and value are not seen.*
- *Thesis could focus on defining milestones along the journey of APM to demonstrate value. As it will keep the organization engaged along the maturity journey.*
- *APM is a long journey and not a destination.*
- *Discussed Enterprise Process model assessment, similar assessment can be done for the proposed maturity model.*
- *For empirical assessment don't just have to stick to architects but can also talk to other stakeholders.*
- *Don't focus on ITPM as a whole, just focus on APM.*

Action Items

- *Request Enterprise Process Model assessment literature document*
- *Get a list of stakeholders to consider for empirical assessment of a proposed model.*
- *Schedule bi-weekly Meet for further discussions*

Appendix B

B.1 Email-1

Mail - naik, nilay prashant - Outlook

Master Thesis Initial Communication

naik, nilay prashant <nilay.naik@[REDACTED]>

Thu 4/20/2023 6:27 PM

To: [REDACTED]

Cc: [REDACTED]

📎 1 attachments (2 MB)

[REDACTED] THESIS INFO.pptx;

Hello [REDACTED],

As you know, I am based out of [REDACTED] and I am doing my internship on IT Strategy and Architecture with [REDACTED]

First half of my internship was focused on gathering hands on experience on how [REDACTED] manages their Application Portfolio Management (APM) Process. As part of the DigITize initiative I have been working on developing analytics dashboards that provide insights into our APM processes. You can access these dashboards here: Solution Center Insights , Config Center Insights , Data Certification Dashboard.

Now, during the second half of my internship, I am focused on doing my Master Thesis on the topic "Benefit Realization of Application Portfolio Management". So far, I have done an extensive literature review on the subject of APM. Both the literature review and the practical insights from [REDACTED] seem to agree that the benefits of APM are not realized until later stages of maturity are attained in the APM process. As a result of this, the stakeholders might fail to see the real value of APM overall. Attached few slides will provide you background into the problem statement for my thesis.

Taking this as a problem statement, my thesis attempts to define a maturity model that is rooted both in the APM literature as well as in practice, that can be utilized to map the expected benefits at every stage of the maturity model. The outcome is to provide the stakeholders a clear understanding of the timeline of the expected benefits so that they don't fail to see the value of APM.

While I have the preliminary maturity model ready based on the literature review so far, I believe that your input as practitioners of APM would really add value to shape up the final maturity model. Therefore, I would really appreciate it if you would be available to answer a few questions, discuss and provide your feedback on this.

I will schedule a meeting with you soon for the same. About 2 weeks before this meeting, I will send the proposed model along with a list of questions I intend to ask.

Kind Regards,

Nilay Prashant Naik

IT Intern

[REDACTED]
[nilay.naik@\[REDACTED\]](mailto:nilay.naik@[REDACTED]) | +31 [REDACTED]

B.2 Email-2

Mail - naik, nilay prashant - Outlook

Re: Master Thesis Initial Communication

naik, nilay prashant <nilay.naik@[REDACTED]>

Tue 5/9/2023 1:33 PM

To: [REDACTED]

Cc: [REDACTED]

📎 2 attachments (330 KB)

informed-consent-form-[REDACTED].pdf; Proposed Maturity Model.pdf;

Hello [REDACTED],

As promised in my last email about Master Thesis, please find the maturity model for APM attached to this email.

Additionally, I have included an Informed Consent Form, which I kindly request you to fill in and sign at your earliest convenience and send back to me.

Here is the brief description of the model:

The proposed maturity model serves to categorize a company's APM into one of five levels of maturity. Each level and its corresponding description can be found on the left-hand side of the model.

In the middle section of the model, you will see the management processes that must be implemented at each level to indicate the level of maturity. The arrows between the levels indicate a requirement or pre-requisite relationship (A->B: A is required for B).

Finally, on the right-hand side of the model, the expected benefits are mapped at each level of maturity. Please note that the benefits highlighted at a particular level are not limited to that level but rather continue to grow as the maturity level increases. This serves to suggest the level at which the company should begin measuring the benefits.

In the 1-hour meeting Scheduled with you on [REDACTED], I plan to go over and get your input and feedback on the following topics in a semi-structured manner:

1. Introduction and Explanation
2. Benefits
3. Management Processes
4. General
5. Wrap up.

This research has been evaluated and approved by the Ethics Committee(BMS) of the University of Twente.

Kind Regards,

Nilay Prashant Naik

IT Intern

[REDACTED]
[nilay.naik@\[REDACTED\]](mailto:nilay.naik@[REDACTED]) | +31 [REDACTED]

B,3 Email-3

Mail - naik, nilay prashant - Outlook

Re: Master Thesis Initial Communication

naik, nilay prashant <nilay.naik@[REDACTED]>

Mon 6/5/2023 3:29 PM

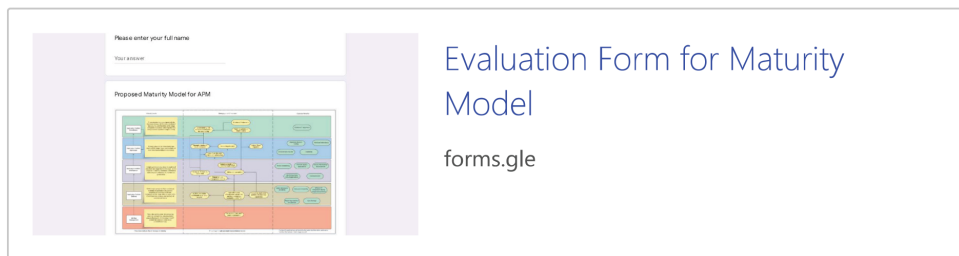
To: [REDACTED]

Cc: [REDACTED]

Hello [REDACTED],

I would like to thank you for participating in my master thesis to provide insights based on your experiences, it will really help me improve the model.

Please take a few minutes to fill out this Expert Evaluation Form about the maturity model: [https://forms.gle/\[REDACTED\]](https://forms.gle/[REDACTED])



□

I really appreciate the help, do reach out to me with any questions or feedback you may have.

Kind Regards,

Nilay Prashant Naik

IT Intern

[nilay.naik@\[REDACTED\]](mailto:nilay.naik@[REDACTED]) | +31 [REDACTED]

B.4 Informed consent

Informed Consent Form for Master Thesis APM Research

Please tick the appropriate boxes

Taking part in the study

- I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction. Yes No
- I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason. Yes No
- I understand that taking part in the study involves a Recorded and Transcribed MS Teams Interview. Yes No

Use of the information in the study

- I understand that information I provide will be used for improving the quality of the proposed model and the master thesis report. Yes No
- I understand that personal information collected about me that can identify me, such as [e.g., my name or my position at the company], will not be shared beyond the researcher. Yes No
- I agree that my information can be quoted in research outputs Yes No


Consent to be Audio/video Recorded.

I agree to be audio/video recorded. Yes No

(The recordings will be stored in Teams and OneDrive for Business.

This recording will be transcribed. The transcriptions and the recoded data will be deleted 2 months after the end of research.)

Signatures

	_____	_____
Name of participant [printed]	Signature	Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Nilay Prashant Naik		08-05-2023
Researcher	Signature	Date

B.5 PPT1

Master Thesis
Application portfolio Management
Using Maturity Models to provide a timeline for benefit realization

Introduction

APM Requires

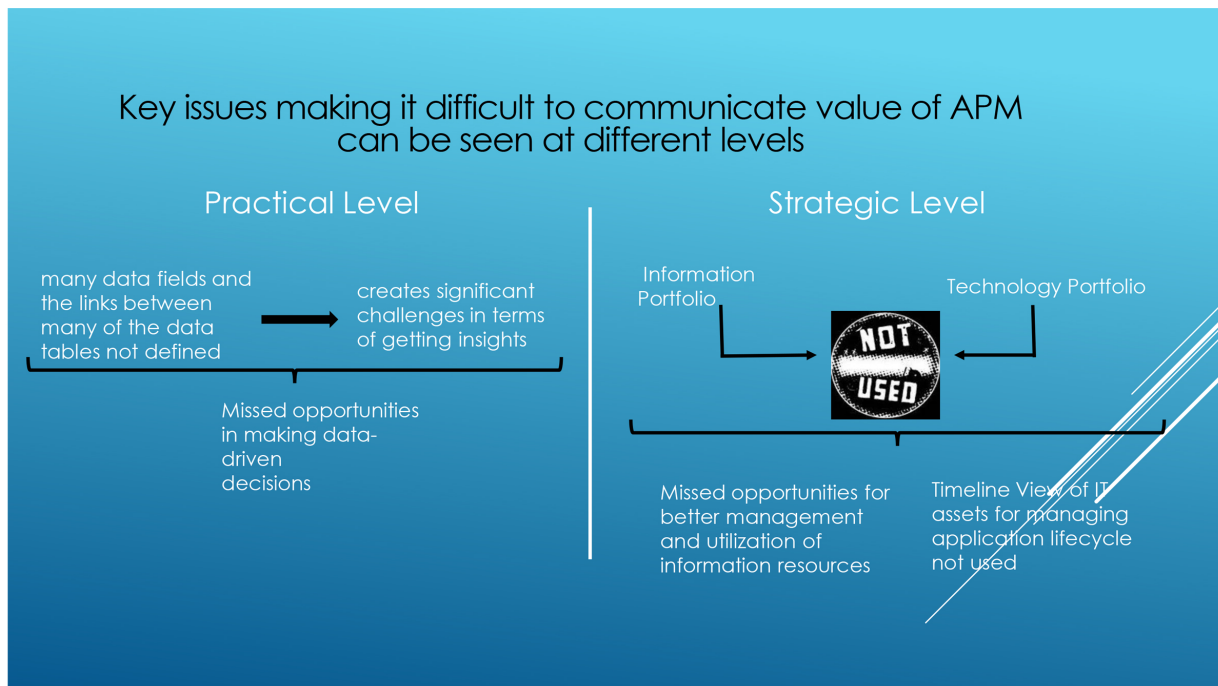
- Tools and Technology
- Human Resources
- Stakeholder Involvement

Significant Investments

Most of the major benefits are anticipated benefits until all capabilities of APM have been developed

↓

Difficult for enterprise architects and other IT leaders to convince and explain the value/importance of APM to the stakeholders



Problem Statement

- Most of the major benefits of APM are not seen in the initial phases and are anticipated benefits until all capabilities of APM have been developed
- The benefits are difficult to measure and some of them often cannot be measured in monetary value.
- It is therefore challenging to show the value of APM to the stakeholders as the benefits expected are not seen.

How I Plan to solve it

My thesis suggests the use of **Maturity Model** as a way of providing a roadmap for achieving the benefits of application portfolio management. Looking at the key features and components to define levels of maturity as well as the potential benefits a company can see as it progresses through the levels of maturity.

Three Maturity Models from literature were reviewed

1. Model by Jeffery and Leliveld
2. Model by Simon et al.
3. Model by Ross.

Summary of Existing Maturity models

1

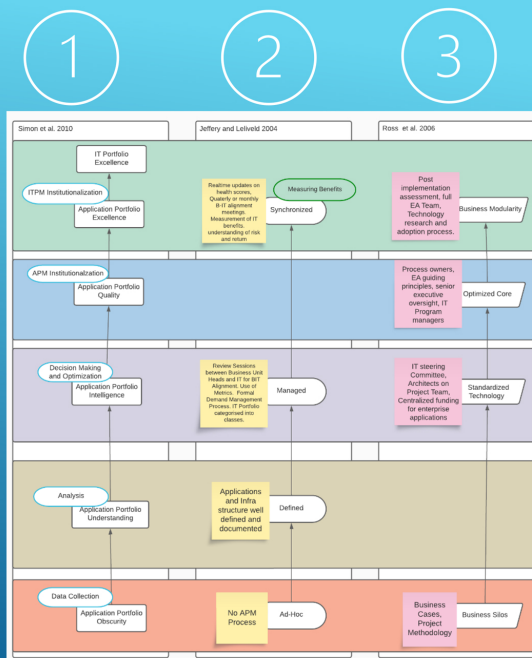
- Most Elaborate and Latest

2

- Most cited in literature
- Mentions Benefit Measurement in last stage

3

- Mentions Management practices



Proposed Research Question

How can a practical maturity model further operationalize theoretical models for application portfolio management, by defining a roadmap with clear benefits and activities?

Sub-Questions

- 1. How can the existing maturity models be adopted to create a maturity model for APM?**
- 2. How can benefits be mapped to the levels of the proposed maturity model to create a timeline of expected benefits?**

Thank You