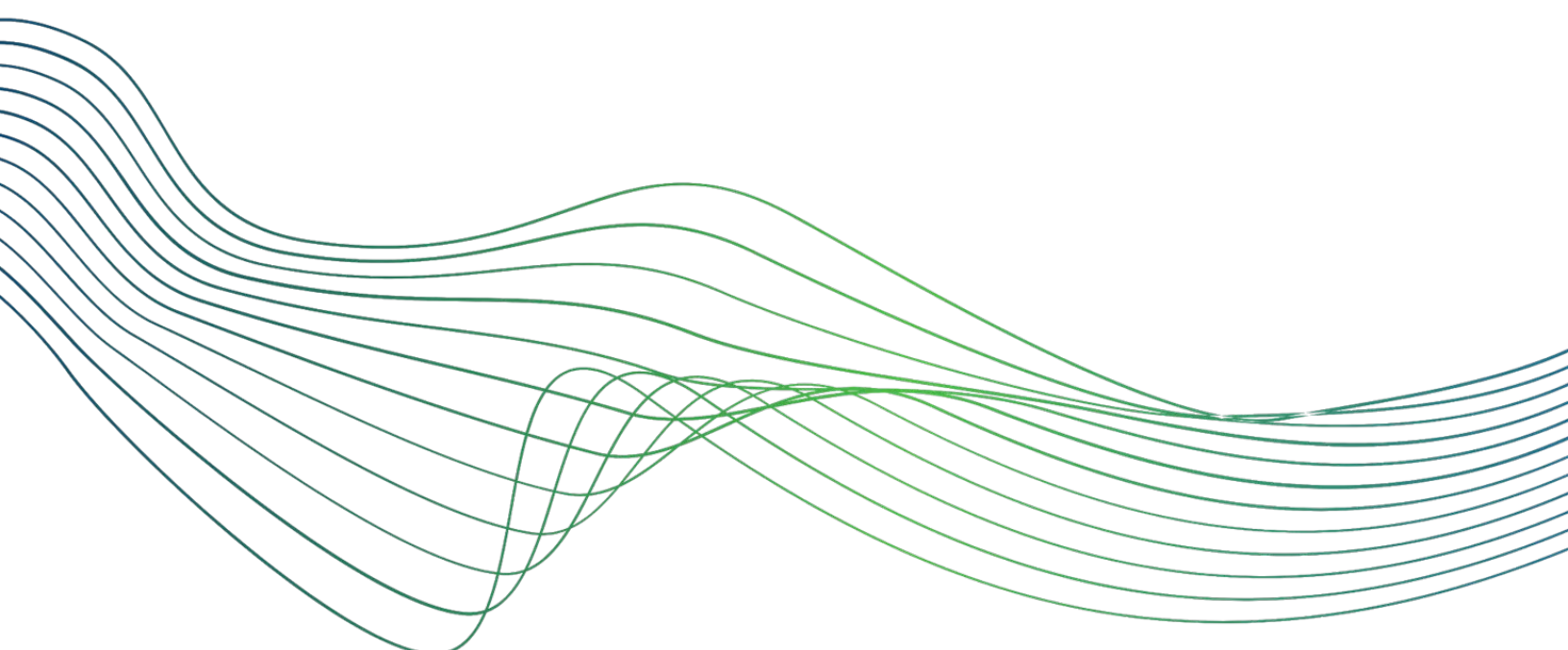


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Digital Maturity Model White Paper

Navigating organizational digital transformation

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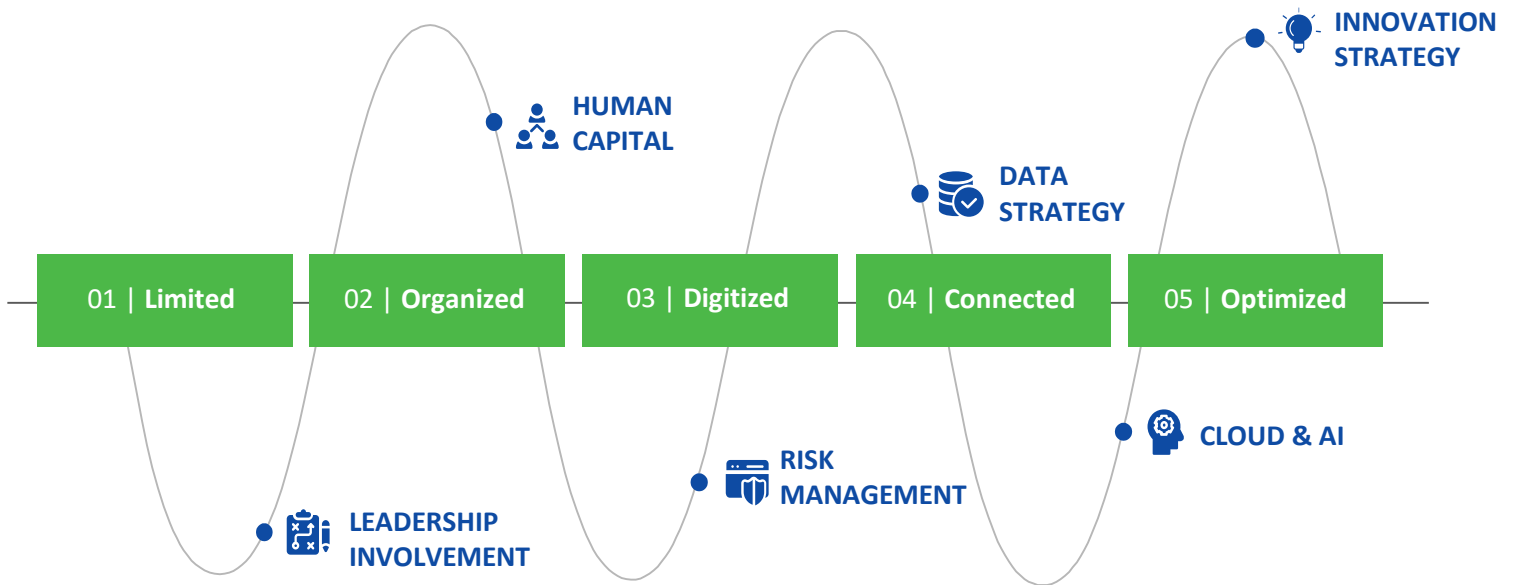
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Executive Summary

Digital maturity within an organization relies on different digital aspects, including strategy, implementation, and execution. To ensure success, a supporting framework can be utilized to make the best organizational decisions, which can detail the current stature of an organization’s digital advancement. This white paper details the methodology necessary to obtain a high-level understanding into an organization’s digital status, and the progression to digitally transform. The framework gives insight into an organization’s current state, the key strategic themes to grow, knowledge for the decisions of digital evolution, guidance for the creation of a defined roadmap, and the ultimate measurement of progress throughout the process.



Introduction

Industry-wide digital evolution promotes the planning and execution of distinct institutional digital maturity. Although open to interpretation, an organization's digital maturity refers to how technology is applied, integrated, and leveraged within its respective structure, and how optimized these technological processes are. This digital maturity model evaluates where an organization is in terms of its digital competency and offers a practical approach to transform for the future. As digital maturity is improved, greater efficiency and optimization can be evidently seen, proving to be both internally and externally beneficial for an organization. Ultimately, the maturation that institutions are bound to face in this fast-paced digital-era will aid them in long-term areas such as cost-savings, discovering advanced technologies, workforce efficiency, data management, and future operational strategy.

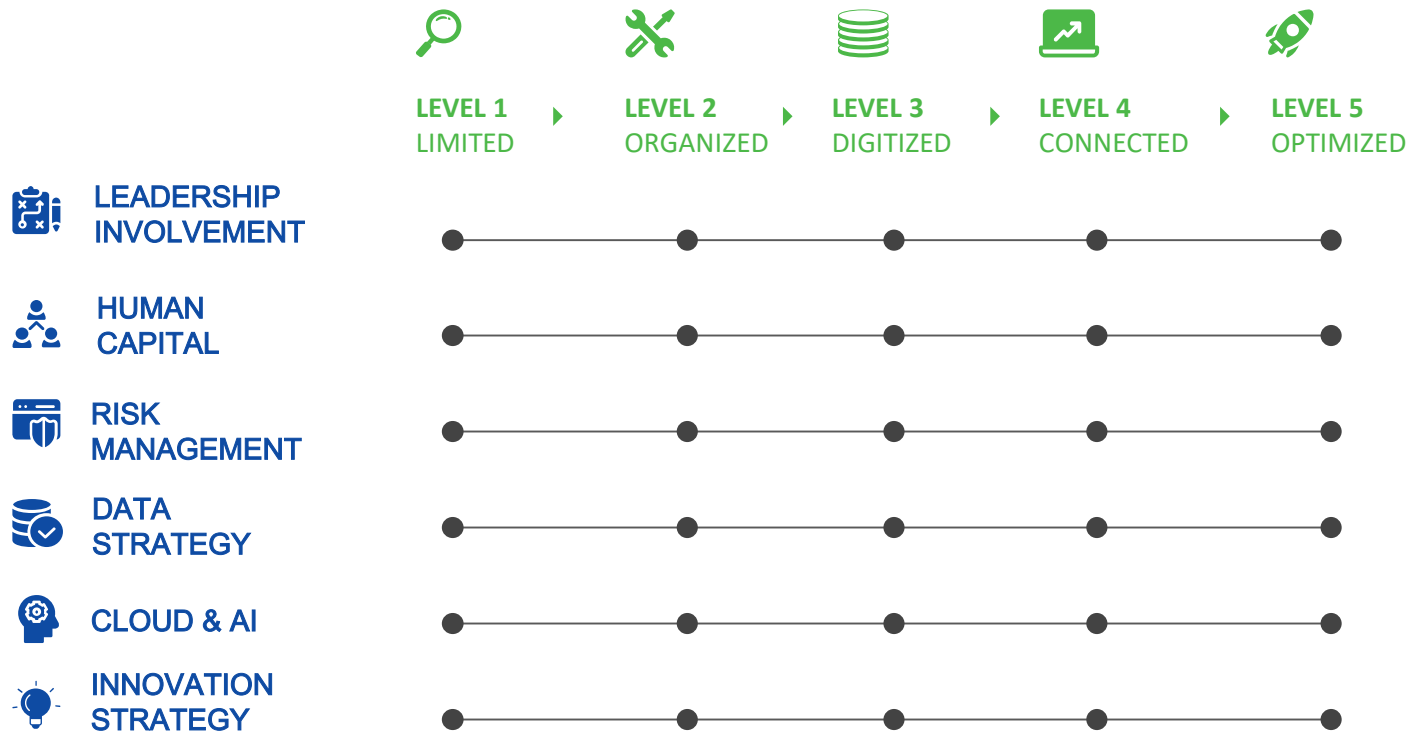
With the pandemic, digital progression came faster than expected. According to McKinsey & Company (2020), there is a belief that the public has vaulted five years forward in consumer and business digital adoption in a matter of around eight weeks, and remote working is here to stay (para. 2). In turn, a digital overhaul was crucial for many organizations to keep operations running smoothly, and in preparation for the future, an assessment and plan for digital maturity adaptation is a necessity. New standards have been established, and the digital transformation of a business is all about where to get the "biggest bang for your buck."

To truly encompass digital transformation, an organization needs to understand its respective goals, and what the ultimate destination is. Some institutions may want to be the most digitally mature across the board; conversely, some may wish to be digitally advanced in some areas and optimized in others to accommodate for cost and practicality. In turn, the digital maturity of an organization may vary from the optimal industry standard. If an organization has met its goals for digital maturity in respective areas, then it can be considered as transformed.

An organization, at its core, needs to develop, evolve, and progress digitally to keep pace with the technologically advancing world around them. To do so, a thorough apprehension of an institution's current digital state, alongside what steps are imperative for growth to occur, is vital. Understanding the current state of an institution is advantageous, but more so, the digital maturity model provides recommendations and strategies that are easily digestible for future digital progression. In the end, industry digital transformation is inevitable, but an institution may lack an apprehension as to how to evolve. An evaluation of the current digital state, paired with ideas on how to mature, will be a priceless tool for the technological solidification of an organization's future.

Framework Overview

Within the framework, there are six total dimensions: *Leadership Involvement, Human Capital, Risk Management, Data Strategy, Cloud and Artificial Intelligence, and Innovation Strategy*. For each dimension, there are five defined levels: *Limited, Organized, Digitized, Connected, and Optimized*. Limited is the weakest level of maturity, whereas optimized is the highest level; the goal of the framework is to assess the prevailing case of digital maturity of an organization by dictating at which stage of each respective dimension they preside.

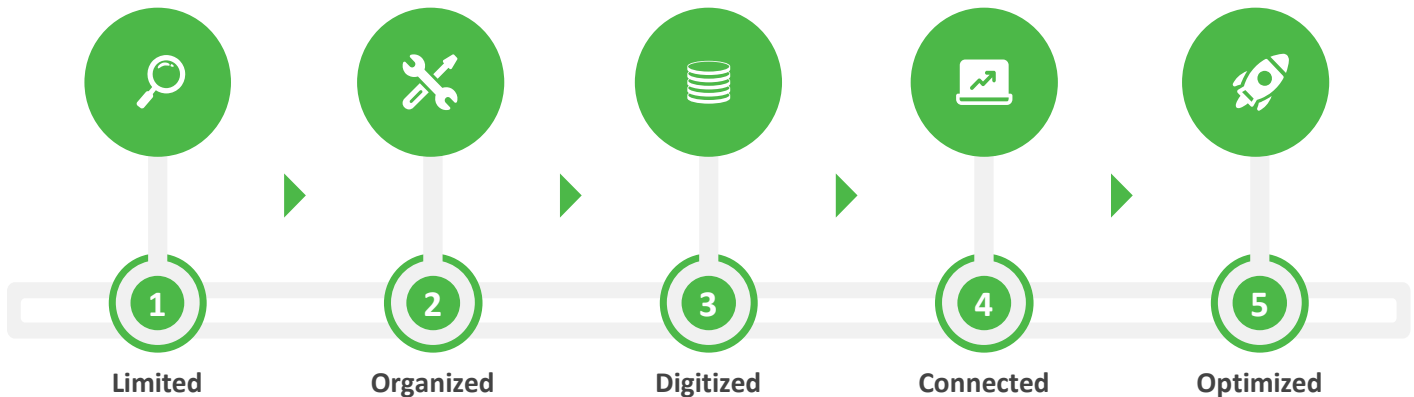


In doing so, a series of strong, justifiable, and easily comprehensible metrics need to be present, as a subjective interpretation of organizational digitization may not provide the insight necessary for improvement. In this framework, metrics are used to quantify different areas of digital operations and are used concurrently with subjective concepts to explain the breadth at which these metrics are required to measure different areas. These metrics, as well as key performance indicators (KPIs), are crucial to garnering the full picture of the present situation, but also to describe a feasible solution and plan for the coming future.

Using the detailed descriptions for each stage, an initial assessment can be performed to deeply comprehend what level an organization wishes to reach. Under each dimension, there is a clear guideline on suggested steps to get to the next level of digital maturity, and this guidance will ideally promote the start of digital growth. Finally, a structured long-term plan for the utilization of new technologies will not only employ the concepts from the framework, but provide answers as to how end users will be given more value every day.

Level Analysis

Gauging the level of achievement within digital transformation initiatives is instrumental in understanding an organization's progress. With a more encompassing comprehension of the digital ecosystem an organization currently possesses, being able to quantify and benchmark the capabilities across all dimensions that are being analyzed is vital. Analyzing an organization's level of digital maturation allows for future roadmaps to foster sequential elevation in capability through the established levels *Limited, Organized, Digitized, Connected, and Optimized*.



1. Limited: Insufficient collaboration and coordination that blocks growth from occurring are key characteristics of the limited level. Digitally-oriented projects are scarce, and when implemented, are often executed manually, with a lack of testing, formal processes, and review. There is nearly no direction or strategy in place that outlines the digital transformation goals an organization has, as well as which resources must be committed to achieving them.

2. Organized: Organized organizations typically begin planning projects with primitive capabilities due to the infancy of the processes and inadequate understanding of timelines and resources. At this level, organizations are working at a higher degree to allocate resources towards revamping the current digital ecosystem in order to gradually elevate digital maturity.

3. Digitized: Digital technologies are being used on projects which are completed through the early use of capabilities such as cloud computing, artificial intelligence (AI), and automation. At this level, organizations are leveraging newer technologies to streamline and benefit from their newfound capabilities.

4. Connected: Connected technologies allow organizations to use digital tools across divisions and other groups, through functions and processes allowing tasks and projects to be automated. Expanded access to advanced technology, alongside cultural shifts towards adopting newer tools as a part of increased digital maturity, has allowed for widespread use within an organization. Increased automation is a defining characteristic of this level.

5. Optimized: Optimized digital maturity of the organization extends to deliver an enhanced experience for all external and internal users as they utilize the newly transformed digital ecosystem. Institution-wide implementation of the streamlined digital tools has allowed for increased productivity and continuous process improvement. Organizations are transformative and actively looking for future technologies to amplify the current return on investment (ROI).

Dimension Analysis

Evaluating digital maturity is a multi-faceted paradigm, requiring multiple levels and dimensions to be integrated interdependently. In order to provide a holistic approach to assess an organization's digital ecosystem, organizations have the ability to rank the digital program's strength across six dimensions of *Leadership Involvement*, *Human Capital*, *Risk Management*, *Data Strategy*, *Cloud & Artificial Intelligence*, and *Innovation Strategy*.



DIMENSION 1 LEADERSHIP INVOLVEMENT

Integral to the acceleration of digital transformation is the collaboration and resilience of executives; defining and transforming an organizational culture, at its core, revolves around the precedent established by leadership. This dimension concentrates on the digital-oriented leadership initiatives and change management methodologies.



DIMENSION 2 HUMAN CAPITAL

Establishing a technology-forward workforce strategy is crucial to evaluating the effectiveness of digital initiatives regarding personnel engagement. The human capital dimension assesses an organization's digital rapport by measuring the duality of how technology is leveraged to advance the workforce and how the workforce is leveraging technology.



DIMENSION 3 RISK MANAGEMENT

In evaluating digital transformation, proactively assessing and managing risks is imperative to eliminate threats and maintain stability. The risk management dimension involves the measures taken towards developing and maintaining a robust risk management plan, in addition to the dynamic actions taken to continuously prevent risks.



DIMENSION 4 DATA STRATEGY

Discovering the full potential of digital transformation involves leveraging data to drive insights and optimize decision making. The data strategy dimension centers around the factors involved in establishing a comprehensive approach in utilizing data to take an organization's business and technical initiatives to the next level.



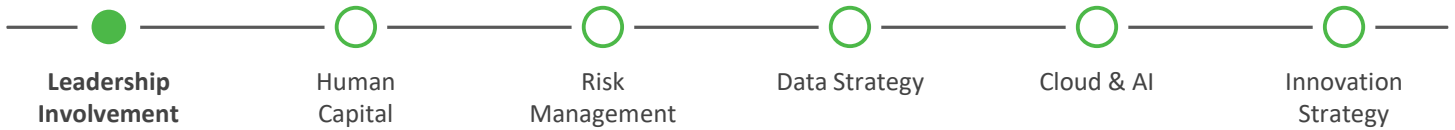
DIMENSION 5 CLOUD & AI

At the forefront of the modern-day digital space are cloud and artificial intelligence, two key players in taking an organization's technology operations to the next level. The cloud & artificial intelligence dimension assesses an organization's awareness, implementation, and usage of the technologies to meet and eventually transcend organizational needs.



DIMENSION 6 INNOVATION STRATEGY

A leading factor in advancing digital initiatives is the level of emphasis placed on strategizing disruptive technology approaches to enhance ventures across the organization. The innovation strategy dimension focuses on the initiatives taken to encourage and embrace innovation to strengthen the organization as a whole.



1 Leadership Involvement

Any lasting transformation begins with leaders formulating a vision for success, based on the mission to progress from the status quo. Transformation can be as simple as meeting a demand in the market, or a desire to cut costs. The ability key leadership has in shepherding resources across other horizontals is instrumental in the overall improvement of the organization. Digital transformation, at its core, is not only reliant on a leader's involvement in outlining a plan for the future, but by also nurturing the engagement as it progresses. Another key element is the fluid relationship between leaders and organizational culture, and how creating an interdependent relationship will enhance performance and collaboration. To properly gauge success in leadership involvement, *Executive Initiative* and *Change Management* are key indicators that will be further discussed.

Metrics

Responsibility Allocation

With any digital transformation engagement, the allocation of a leadership team's attention to the engagement is a key metric in understanding the initiative's level of priority. From a holistic view, being able to quantify the proportion of responsibility allocated on digital transformation engagements speaks volumes about the importance of different initiatives as it reflects the value added internally to employees as well as to external parties such as clients or stakeholders. There is an entirely different impact in an engagement that is actively and consistently supported, and understanding how leaders prioritize their time and effort is key to determining their involvement and impact.

Budgeting

Similar to how time is allocated, budgeting is indicative of how leaders prioritize, substantiate, and execute on transformation strategies. As leaders develop these strategies, the proportion of the budget dedicated to digital operations is relevant in understanding how the gap will be closed between concept and practice. The budgeting involved in external groups under digital operations is also important to take into consideration when understanding how organizations are actively seeking the infrastructure and expertise of other groups to meet their goals.



1.1 Leadership Involvement | Limited

Executive Initiative

At this level, there is no executive initiative present by the leadership team to strategize and publish a digital transformation strategy. There is either no desire for any digital transformation, or it is not feasible at this time to an organization's leadership to discuss the possibility. When it comes to budgeting, there is little to no capital allocated for digital transformation operations.

Change Management

Change management has no emphasis at the limited level. From a cultural standpoint, an organization is relatively focused on different priorities at this time, and transformation in any regard is most likely lacking. There is no responsibility that is given to any leaders to explore and execute a digital transformation initiative.

Moving to an Organized Level

- Formulate a plan of action forward to take an initiative to improve digital maturity internally. It is imperative to discuss digital maturity in order to improve organizational efficiency.
- Dedicate appropriate personnel at an executive level to act as the cultural trailblazers of the organization. Understanding how change management will look internally will allow for a gradual elevation to the organized level.



1.2 Leadership Involvement | Organized

Executive Initiative

The biggest hurdles at this stage relate to what the transformation will entail in terms of its costs and impact. At the organized level, there are leaders who are taking the responsibility of promoting and managing these aforementioned projects. Roadmapping has improved and the direction the organization wants to take is far more clear. One of the key indicators of the organized level is the lack of implementation. Implementation is likely siloed to one vertical where transformation is at its infancy. The teams within the vertical are very dependent on a leader to drive transformation and discovery. There is still a large disparity between idea and practice.

Change Management

With strategy, it is vital to understand the resources committed, and the respective allocation. Increasing the amount of quality time and capital that is given to a digital transformation initiative will allow for change and results sooner; however, at this time, executives have only taken steps to lay the groundwork to eventually bolster their digital capabilities. Execution at this level is minimal as more effort is given to laying the groundwork for an eventual larger deployment and initiative for implementation. An organization is focused on other priorities at this time, but vocal in its desire to take steps forward to improve and influence its culture to be more digital-centric.

Moving to a Digitized Level

- Determine the path forward in order for the leadership team to have a vision of how to budget and allocate resources appropriately to implement the beliefs and strategies in place into practice.
- Encourage the adoption and optimization of the current array of digital tools. Until leaders drive change down each respective vertical, their maturity will not elevate to a digitized level.



1.3 Leadership Involvement | Digitized

Executive Initiative

At the digitized level, initiative is being taken by the leadership team to publish a digital transformation plan, and the visibility of this plan internally is being improved. There is a clear plan of action that has been drafted, and the leadership team is behind this strategy. At this point, leadership is working on implementing and adapting the needed resources towards their laid out strategy. Any digital transformation initiatives are not at a full-scale implementation yet, but leaders are working on improving scalability of the proposed solution. There are dispersed implementations inside of the organization, and scalability is the main goal of the organization in order to elevate their current impact.

Change Management

The transformation plan has moved from leadership level and is diving down each respective vertical within a given organization. The strategy implementation is at a working stage where the concept of digital transformation has moved past a concept, and into a reality. From a culture standpoint, an organization has expressed making this a priority in the coming future. Top-down leadership efforts are underway to better repurpose localized leaders, such as subject matter experts and project managers, towards the mission of digital transformation.

Moving to a Connected Level

- Refine the direction and the internal strategy and execution of the plan in place in order for additional improvements to be made as widespread adoption and optimization of tool use occurs.
- Dedicate the right personnel and individuals at an executive level as they are the cultural trailblazers within an organization. Beginning the conversation of how the change management will look internally will allow for a gradual elevation to the organized level.



1.4 Leadership Involvement | Connected

Executive Initiative

At the connected level, a clear and fluid direction has been established to transform the digital capabilities of this organization. A transparent plan of action has been implemented, and the leadership team is behind this mission to increase efficiency while continuously driving change. At this point, leadership has clearly allocated resources accordingly so that a full-scale deployment of the new digital capabilities can be used. This is a full-scale digital transformation that is reaching all horizontals; however, the full adoption vertically has yet to happen. Full efficiency of the deployment is still an issue; however, performance enhancements to the deployment are clear going forward. Automating how transformation takes place internally is now being implemented within the deployment. Going forward, organizations look to continuously improve in order to keep productivity high relative to the capabilities of the tools on the market.

Change Management

By investing in change management, an organization has elevated to a point where their digital transformation projects are fully functioning -- this is a full-scale deployment. The strategy implementation is at a working stage where the concept of digital transformation has moved to the post-execution phase. The organization has made digital transformation a priority, and the internal transformation is evident in the enhanced skill sets that are now available. The organization is in the process of fully adopting the new digital tools, and training and usage are increasing to attain a 100% adoption. Leaders have done the work at this point to lead by engagement and example to facilitate a change in culture. This interdependent leadership culture has allowed for increased complexity across all other horizontals, and is now working down each respective vertical to continue driving a theme of increased digital competency.

Moving to an Optimized Level

- Leverage the digital transformation implementation to efficiently leverage their new digital ecosystem while keeping leaders focused on pivoting to future innovation projects.
- Optimize what change management looks like for internal users, external users, and for stakeholders to streamline the impacts of optimized digital capabilities.



1.5 Leadership Involvement | Optimized

Executive Initiative

At the optimized level, the digital transformation strategy has been implemented, and is now standard operating practice. Leaders have leveraged these new digital tools across all horizontals. Refinement processes have finished, and the tools have reached full operating strength with maximum efficiency given their current workflow. There is a standard in place for what is needed resource-wise to operate at maximum efficiency. To elaborate, leaders have found the right balance with the amount of personnel and how much funding is needed to operate at a fully scaled level. Formal automated digital transformation within the organization allows for a layer of continuous improvement and adoption that allows organizations to stay at peak efficiency. Leaders are fully engaged in implementing the technologies of the future into their digital ecosystem in order to continue driving innovation.

Change Management

The digital transformation has reached fruition and is fully functioning -- this is a scaled, yet optimized transformation. All inefficiencies are known, and either eliminated or minimized. From a culture standpoint, an organization made this a priority, and is now shifting accordingly to the next engagement. The organization has fully matured, and is getting the most out of the tools they are now using; however, technology leaders are constantly looking for new tools and innovations to continue driving productivity past their current deployment. An innovative culture is evident in the way leaders are cultivating and nurturing more unorthodox thinking; however, leaders are now engaging in simultaneous advancement where beliefs drive practice and vice versa.



2 Human Capital

As a dimension of a business, human capital is crucial to operations and the ultimate success of an organization. Each level for this dimension serves to illustrate the understanding an organization has behind the utilization of their human capital, and how exactly the workforce is managed. Human capital is a rather difficult dimension to quantify, and in turn, looking at the financial data behind an organization can dictate and communicate its operational efficiency and effectiveness. Alongside that, overall ideas such as the attraction of talent can truly dictate the productivity of the organization’s current structure of employees, and in turn how efficient it is. Furthermore, planning for the future of said talent, as well as research and retention of talent by the organization, proves to be a large part of the strength of an organization’s human capital. To understand and streamline the versatility of human capital in any business, quantification to some extent is required; however, due to the subjectivity of human capital and its dependence on the business/organization itself, the majority of the assessment behind the strength determination of human capital should be question-based, reflecting on the metrics and ideas discussed below. Specifically, *Effectiveness*, *Retention and Talent Acquisition*, and *Workforce Strategy* are the overarching categories utilized to analyze the human capital archetype.

Metrics

Effectiveness Ratio

The simplest method to quantify any business’s human capital is to look at an efficiency ratio. The efficiency ratio models how an employee and the cumulative workforce operates to maximize efficiency in the timeframe and resources allotted. In layman’s terms, the ratio calculates how effective a workforce is to fulfilling the organization’s mission. The workforce’s efficiency would lead to an organization gaining more traction towards achieving their mission, in both a cost-efficient and technologically advanced manner. Ultimately, the mission of an organization is what the staff should be carrying out. Combined with the other metrics, a total understanding of the organization’s ability to maintain an efficient workforce can be found.

Turnover Rate

Retention, or the turnover rate, of an organization is extremely valuable to the strength of its core human capital. Turnover rate is defined by the formula $(\# \text{ of Separations}) / (\text{Average \# of Employees}) * 100$, and in essence, determines the organization’s ability to maintain its employees. If employees are leaving the organization en masse, then clearly there is an underlying problem with how progress is being tackled. Using data analytics, organizations can analyze and interpret internal performance to compute an accurate measurement for this metric.



2 Human Capital

Workforce Strategy

As the necessity for quality employees increases, the knowledge gap that exists between more experienced employees and new hires has to shrink. An organization invests a lot of money and time into three large categories: on-the-job training, technology, and services to increase productivity. This workforce strategy metric will test the totality of knowledge, productivity, sustainable investments, and progression of the workforce's abilities. In terms of knowledge, many organizations tend to educate employees when they join, as industry experience in new recruits tends to be low. The quantification of productivity is truly based on the internal organization's standards. An institution would be measuring the total factor productivity it has by evaluating every single different subteam within its organization. Overall, it would be based on what differentiates organizations and what specific metrics can be applied to internal productivity standards. As strategy is a large part of how an organization can thoroughly comprehend its human capital, a subjective review in some form, such as a simplistic questionnaire, can provide insight into the planning of that institution. Alongside this, the understanding of the investments present into developing workforce abilities, and the measurement of said development is crucial. Full apprehension of the workforce can provoke a series of open dialogues for the organization internally, and downstream make the necessary improvements.



2.1 Human Capital | Limited

Effectiveness

Effectiveness is extremely low, ultimately proving that the workforce within the organization is ambiguous. Most employees in the organization are facing a lack of knowledge and understanding to solve the majority of internal problems, both digital and business related. The organization’s mission has not been discussed at all, and little is being done to promote the workforce to strive for achieving this goal. The efficiency of the organization is low, as the time used by the workforce to complete projects is not comparable to the overall funds and resources used.

Retention and Talent Acquisition

In this stage, most organizational employees are dissatisfied or leaving the organization. Retention of said employees is extremely low, and in turn is leading to continual replacement of roles, with a lack of skill maintenance and progression. Alongside this, the organization struggles to attract any new talent and maintain it. Ultimately, this retention rate and lack of talent maintenance is leading to an overall knowledge disparity for useful digital technologies. Improvement of work-life balance, internal organization, and efficiency is required to further emphasize the cruciality of digital growth and transformation.

Workforce Strategy

At this point, there is no planning for the future, and a lack of any coherent strategy for the development of an organization’s employees. Investments are low in advancement of technology, skillset, and productivity. The majority of money is being used in the survival of unnecessary factions of the organization rather than improvement of the technology used. Productivity is non-existent, and individuals are not doing what is required of them to maintain the balance of the organization. Improvements are necessary in general allotment of funds to benefit the workforce and talent attraction. Organizational workforce does not have agility or versatility to think and work on their feet, possibly evident by the response to digitization due to COVID-19. Improvements in planning and advancement is strongly required, such as a defined five and ten year plan, alongside a clear methodology to find proper talent and maintain it.

Moving to an Organized Level

- Begin strategic planning for workforce utilization, and slowly begin to improve productivity measurements through implication of new metrics.
- Begin development of talent acquisition guidelines and plans, as well as a methodology to define skills necessary for the current and future employees.



2.2 Human Capital | Organized

Effectiveness

Employee talent acquisition is improving, and every employee is committed to the organization as a whole. Skills required to improve the organization are defined, and individuals are taking initiative to learn and understand those skills. However, the lack of technology to ultimately support this growth is prevalent. Organizational understanding of the overall mission has started to be understood, but is not close to being fulfilled. Career growth within the organization is becoming more defined and clear to the employees, but still needs to be improved to fully understand.

Retention and Talent Acquisition

Employees are still leaving at a high rate, but retention is slowly getting better. Talent is coming in at a higher rate, however training improvements, work-life balance improvements, and plans to reduce the knowledge gap need to be in place.

Workforce Strategy

Planning and strategy is still in very early stages, and thorough discussion of ideas need to occur. Nonetheless, this rudimentary planning is a start to improving the organization's abilities within the future of internal and external workforce strategy. Investment in new technology and training has begun, and productivity is on the rise.

Moving to a Digitized Level

- Implement a developed employee retention plan for employees, as well as a methodology to acquire relevant talent necessary to organizational success.
- Define the required and preferred skill sets, and allow for the workforce to begin to learn and acquire necessary skills.



2.3 Human Capital | Digitized

Effectiveness

In this stage, for all the staff-related resources an organization utilizes, around half prove to return back to the organization in the form of efficient employee workflow. Improvements still need to be made to allow for an increase in business efficiency. Understanding and knowledge of skill sets required is more prominent, with individuals taking initiative and learning about how to improve a sector of the organization. Mission understanding is now understood by the workforce, and planning towards accomplishing it has begun. Improvements in optimization still need to be made, but planning to do so is continually present.

Retention and Talent Acquisition

A healthy retention rate is present, and employees are feeling valued at the organization. Human Resource (HR) development and training has begun, and allowed for a sound workplace for the organization's employees. Talent acquisition is speeding up, and career development planning is present and in the beginning stages of definition. Automation planning for ideal talent acquisition and maintenance is in the planning stages.

Workforce Strategy

Planning is officially in stages of implementation, and the strategy implemented has led to evident results in the workforce. Budgeted funds are being allocated towards investing on internal technological development, and training to benefit the efficiency of the organization (i.e. AWS training in parallel to the implementation of internal cloud service usage within the organization's system). Productivity is average, and training and the overall development of employees has started to see a rise in this metric. HR scores have begun to continually rise up along with the usage of the strategy and planning. Increased planning is still necessary, but the workforce is content currently.

Moving to a Connected Level

- Begin detailed analysis of project efficiency, as well as planning for future integration of new skills and technologies.
- Start to make talent requirements clear, and planning for maintaining a strong workforce has begun implementation through headhunters and overall technological automation.



2.4 Human Capital | Connected

Effectiveness

Most of the staff resources used for growth within the organization are proving to return improved efficiency and employee effectiveness. Continual planned improvement is present and active in the growth of the organization. Mission execution has begun and is performed by a majority of the workforce in the organization. Efficiency of projects is relatively high, but improvements can be made to increase overall effectiveness of employees.

Retention and Talent Acquisition

Majority of the employees are staying, and the retention rate has led to a more effective and efficient workforce on hand, with training and knowledge that is extremely beneficial to the organization. Technology to ensure skill growth and understanding is present, but widespread and full understanding is shy of complete.

Workforce Strategy

Workforce strategy and planning is solidified, and the future implementation of growth ideals is concrete and structured well. At this stage, partnering with other companies and organizations to produce a intricate talent acquisition system through headhunters and such is present. Investments in the training and implementation of technology for employees is a significant portion of the budget, and utilizes necessary new ideas to benefit the growth of the organization. Plans for the foreseeable future are well-defined and clear, and career development and progression is prominent in the overall organization.

Moving to a Optimized Level

- Enhance data collection methods, where data is continually collected and analyzed to determine the efficiency and effectiveness of different projects, with discrepancies in comprehension of analyzes mitigated.
- Utilize advanced technology to acquire the quintessential talent and retain current employees, and the use of outside resources such as chatbots are depicting viable results.



2.5 Human Capital | Optimized

Effectiveness

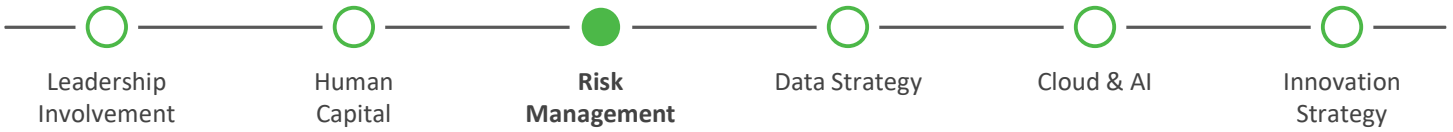
Organizational capabilities are extremely high as the workforce is running at near maximum efficiency. All employees are content and have obtained the necessary knowledge and skills to perform in the most optimized fashion. Actions taken by employees are proving to be profitable for the organization, and projects are progressing at the fastest rate possible. Mission understanding, execution, and implementation are in full force, where the entirety of the workforce has expressed continual dedication to embracing the mission throughout the organization. Overall employee efficiency and effectiveness is as high as possible, and planned maintenance and cordial improvement is planned using internal data metrics and analysis.

Retention and Talent Acquisition

Nearly all employees are choosing to remain in the organization, and this retention rate is leading to a maintained human workforce, with an understanding of different aspects of the industry and expansive total knowledge that is extremely valuable. Talent is coming in as fast as possible, and the overall evaluation of said talent is optimized to harness the most potential. Usage of data analytics, advanced technology, and automation is found to maintain current workforce and expand as necessary. Overall, there is a completely optimized recruitment plan and structured workforce maintenance.

Workforce Strategy

A concrete plan is defined and constantly improved to accommodate for changes in the world (i.e. a pandemic), and most employees are content at the institution. Data is being collected and analyzed to test how strong the training is, and if the new technological improvements are truly beneficial to the productivity of the organization. Ultimately, most investments are yielding amazing results, and productivity is extremely high. Utilization of external resources and advanced technologies, such as chatbots and full automation is present, and there is more than enough talent acquisition progression. Overall, the most ideal situation for a strong workforce and future-proofed strategy.



3 Risk Management

Within any organization, risk management is imperative to secure digital operations and proactively limit the potential occurrence and impact of security attacks. An expansion in data collection and technology reliance presents elevated risks across several realms, including data protection and cloud configuration. In turn, there is an increasing demand to implement proper risk management processes to prevent and mitigate security attacks, identify organizational gaps, and maintain a robust security posture. Risk management is a vital component of all functions within an organization in preventing both internal and external threats. The adoption of a formal plan allows opportunities to limit pernicious impacts, ranging from reputation damage to revenue loss. To explore maturity within risk management, the following section depicts *Security Controls and Measures* and *Governance* as subcategories for the paradigm.

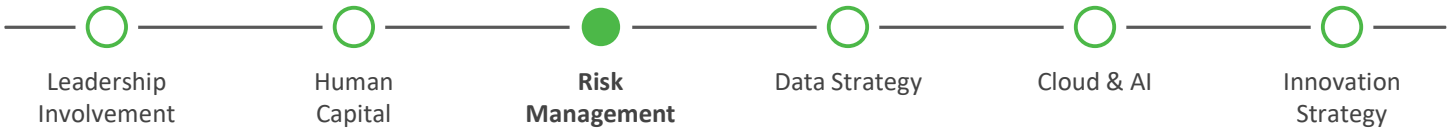
Metrics

Security Awareness Training

Establishing robust key performance indicators is an integral part of assessing risk management and making data-driven decisions. At the root of any risk management program is security awareness. By having proper training processes, companies experience a decrease in breaches, an increase in organizational resilience, and a shift in employee mindsets towards risk. Security training could include topics ranging from phishing and social networking to malware and data privacy. By measuring the percentage of employees that have undergone training and the performance results produced by the training, organizations will be able to assess an essential component of risk management.

Return on Investment

The return on investment (ROI) is paramount to evaluate the impact and efficiency of risk management efforts. ROI is quite versatile in this scenario, and should be tailored towards the organization's chosen metrics based on operational goals. To provide insight, ROI can be quantified by different indicators, such as costs, efficiency, number of incidents, and number of risks mitigated. To successfully measure the ROI of security measures, identifying all core digital assets and functionalities of the organization is imperative; this allows organizations to determine investment values of individual segments of the overarching security infrastructure. Nonetheless, by measuring the impact of risk management procedures, organizations can aptly gauge efficiency, the prospective achievement of goal congruence, and overall performance.



3.1 Risk Management | Limited

Security Controls and Measures

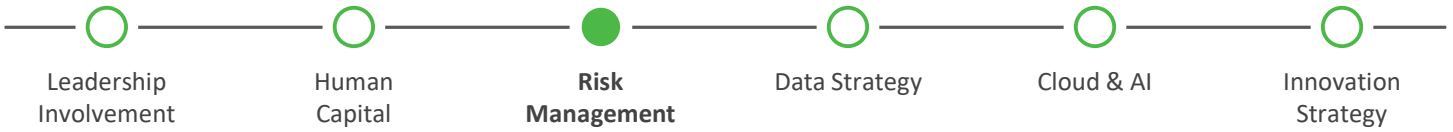
At this stage, security measures are implemented to a limited extent, attributed to inconsistencies in business objectives and performance. The organization’s progress within risk management is consistently hampered by little or nonexistent security controls and measuring techniques. Along the same lines, processes for detection and response may exist, albeit in an undefined format, only performed in an ad-hoc manner. Additionally, consistent metrics contribute to widespread disorganization and a lack of overall direction.

Governance

At a limited level, risk detection and prevention is followed in an ad-hoc manner, due to a lack of fleshed out processes or policies. Security response is often informal and a lack of accountability is extensively observed, leading to general denunciation. Responsibilities and division of work within risk management is informal and sporadic, resulting in shortfalls of providing strategic direction, and in turn, the absence of a comprehensive governance approach.

Moving to an Organized Level

- Begin strategizing and developing plans to implement security controls and measures, whether it be facilitating increased discourse of next steps or outlining a formal roadmap.
- Begin establishing formal processes to increase governance and accountability, including strategizing methods to increase awareness and structure responsibilities.



3.2 Risk Management | Organized

Security Controls and Measures

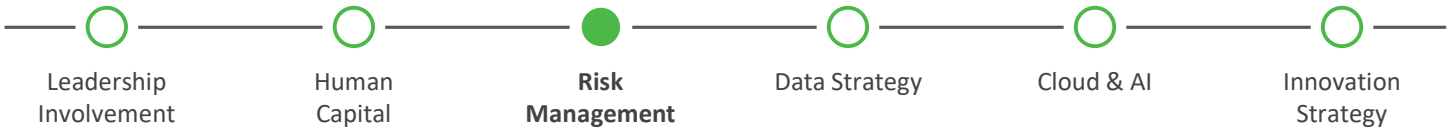
In this phase, processes are beginning to be formed, limited by a lack of widespread implementation. Measurement processes are strategized and may be forming, but an organized and consistent practice is yet to be seen. In parallel, risks have an identification process, but proper documentation may be disorganized. In terms of future direction, there are defined strategies to increase security controls and measures, which could include consulting third-party resources. Furthermore, a roadmap is considered to take security controls and measures to the next level, including but not limited to, providing more emphasis on testing security controls, analyzing critical assets for an intended risk register, and conducting periodic updates of implemented controls.

Governance

At this stage, processes are forming, constrained by a persistent lack of accountability and fragmented responsibilities. Some approaches to risk management begin to prevail, but formal processes and policies are still developing and at an immature level. There is an increased personnel foothold within the security infrastructure, allowing for more insight to better understand shortcomings and challenges within the current system. More units within the organization understand the importance of security awareness and are involved with risk processes, challenged by widespread adoption.

Moving to a Digitized Level

- Elevate initial plans to a higher degree of importance in adopting formal plans to increase security controls and measures, including specific methodologies to meet organizational objectives.
- Expand risk processes and policies to have increased documentation, structure, awareness, and engagement.



3.3 Risk Management | Digitized

Security Controls and Measures

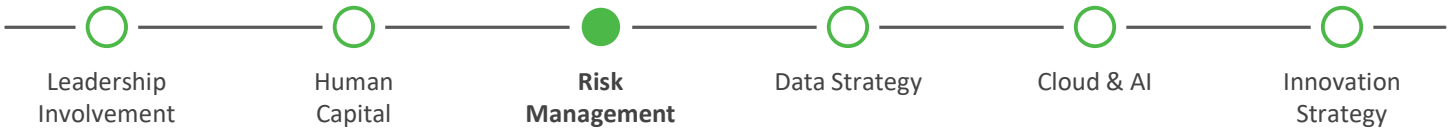
Adoption of formal risk management processes and development of an organized risk register are underway, all of which are communicated to affected parties. Along the same lines, cross-functional teams are becoming more aware of risk management efforts and the significance. Security controls and measures are beginning to become more thorough, considering most critical assets and security operations. In addition, initial testing is performed to assess and consistently update the functionality of controls and measures.

Governance

Risk assessment approaches are defined and structured with formal processes. Respective policies are transparent, documented, and available to the entirety of the organization. Security procedures are defined and are beginning to lead to more consistent use, albeit not completely widespread. Leadership within the organization continuously communicates risk procedures and strategies, leading to greater involvement and governance, cross-functionally.

Moving to a Connected Level

- Turn planning to an action-based approach by adopting the security controls and measures outlined in the initial roadmaps, supplemented with periodic testing and updating.
- Increase structure of risk policies to have full documentation, implementation, and awareness throughout the organization, supplemented with periodic updating and remediation.



3.4 Risk Management | Connected

Security Controls and Measures

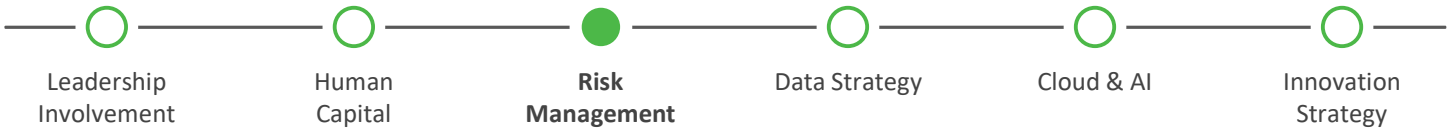
Risk controls and measures are adopted throughout the organization, with routine testing and updating. Testing validates that all controls, procedures, and processes are active, accurate, and updated. In response to testing efforts, corrective measures are taken regarding any weaknesses or potential threats. In terms of analytics measures, metrics are integrated into risk management assessments and begin to have widespread influence for measuring organizational objectives. In terms of advancing current controls and measures, there is increased consideration for future innovation and implementation to break boundaries and enhance current practices.

Governance

At a connected level, risk assessments are structured and fully documented, with a comprehensive risk register communicated to all affected parties. Risk management processes and procedures have a widespread implementation that are regularly followed by technical and nontechnical teams. IT management is involved with updating and remediating procedures to meet security baselines, consisting of streamlined testing and training. Responsibilities are defined and continuously enforced with high prioritization, contributing to increased accountability within the organization.

Moving to an Optimized Level

- Transform current measures by including innovative measures such as automation, iterative refinement, and implementing a metric-based security ecosystem.
- Enhance processes to increase management involvement, have widespread implementation, iterative refinement, and a structured roadmap defining future goals to continuously improve.



3.5 Risk Management | Optimized

Security Controls and Measures

Risk controls and measures are fully optimized and automation dictates security operations. All processes are continually reviewed and necessary improvements are made iteratively. In addition, comprehensive metrics are gathered to assess security posture, in relevance to the behavior of current controls and measures. There is a mindset to continually develop and optimize innovative security approaches. This mindset is shared by all units within the organization; the importance of security controls and measures is extensively ingrained within the organization across all levels.

Governance

At an optimized level, structured organization-wide processes with heavily involved management are evident. Risk assessment processes are sophisticated and widespread, with heavily involved management, outside of just technical teams. Security requirements are optimized, clearly defined, and continuously tested in an iterative manner. Accordingly, milestones and further optimization goals are clearly planned and routinely maintained, with an aim to continuously improve current processes and reach new heights to optimize risk management.



4 Data Strategy

For an organization to remain relevant and perform at its optimal level, having a strong data strategy is imperative as it is one of an organization’s most valuable strategic assets. A defined data strategy drills down core business needs to create an actionable digital plan. Data is at the forefront of peak decision making abilities forming a crucial tool for an organization’s toolkit. Comprehensive data allows an organization to analyze market trends, further necessitating its importance and resulting in better service. Having an optimized data strategy will also allow an organization to optimize its business processes, streamlining operations to allow for increased efficiency. This dimension considers seven main areas to measure an organization’s data strategy maturity: analytics capability, data culture, data literacy, data management, data personnel, systems & technology, and data governance. These are then further categorized in the three groups, namely *People*, *Technology*, and *Data Management*.

Metrics

Quality and Quantity

The Volume, Variety, Velocity, and Veracity, also known as the Four V’s of Big Data (Savkin, 2020), of data are quantifiable metrics that provide a comprehensive assessment of the data to be analyzed. Volume refers to quantities of data that organizations own; variety can be described as the number of different types of data sources; velocity is defined as the volume of data generated or analyzed per time period. Lastly, the veracity metric requires a team to define qualifications of accurate data, depending on the context. The term represents data inconsistency, uncertainty, and ambiguity, ultimately reflecting incomplete or low-quality data based on the ratios of errors and outliers.

Utilization Rate

The key metric for assessing how integrated an organization’s data strategy is the level of usage across the organization, known as the utilization rate. Utilization is typically derived from the decision-making activities of the organization, specifically the amount of an organization’s data actively being used for decision making. If an organization possesses a wealth of high quality data, but with marginal usage, this would suggest weak data management and governance, and in turn, an ineffective data strategy.

Return on Investment

Assessing the return on investment is important for gauging the success of an organization’s data strategy. For example, if a large volume of data is used actively across the organization but reaps proportionally smaller returns, the data strategy approach may be unsuitable. These returns can be determined by the organizations with measures such as the dollar amount earned. ROI can also be split across departments of the organization; perhaps data is being used efficiently in one department, but is producing losses in another. Monitoring ROI helps to determine the weaknesses of an organization’s data strategy and identify key areas to direct focus.



4

Data Strategy

Prioritization

Prioritization refers to how much an organization prioritizes data and the extent data is demonstrated to be an integral part of the organization. On a large-scale, this can be measured by the amount of spending and investment the organization dedicates to data-related technology and personnel. Prioritization is historically benchmarked against competitors to determine whether data is a growing priority within the organization. In terms of training, the organization’s ability to create objectives to develop the data skills of their employees is crucial and can be measured by the percentage of employees that have undertaken a form of training. On a cultural level, a more subjective metric can be utilized, for example, if the use of data is a mandatory requirement in day-to-day operations, or if there is a cultural data standard included by the organization. Looking at cultural aspects would help to depict the general sentiment within the organization on whether data is being viewed in a positive or negative light, and used as a strategic asset in its operations.



4.1 Data Strategy | Limited

People

Throughout the organization, usage of data is often ad-hoc, and has little coordination. Pockets of the organization use data, but most of it is poor quality and not sophisticated enough to be involved with decision making, limiting its utility. There is a lack of coordination and leadership around improving data capabilities, creating a system with little to no accountability for data quality. Minimal data coordination or collaboration exists within the organization, in addition to a lack of dedicated personnel performing data duties. Analysis typically falls on many employees as an additional duty or secondary job and those in data roles have little technical training or experience. From a data literacy point of view, a majority of the workforce only has a basic understanding of data concepts, analytics and use cases, alongside limited communicative ability.

Technology

Analytics is done using summary reports with little or no analysis. This results in primitive reporting capability, aggregated data, and lack of reliable data management or storage capability to provide comparable data. Data is stored in siloed systems whereby database systems typically work independently of each other, commonly having repetitive, unsynchronized information. Reporting is primarily used for status checks and rarely used for business analysis. Data is currently limited to focus on “what” and “when” questions.

Data Management

Siloed data management results in sparse documentation and standards that are not regularly applied. Data is aggregated and collected manually for the use of certain programs or bureaus. Data cannot be easily shared or analyzed, resulting in a lack of widespread analytics. Additionally, business glossaries and metadata documentation are not used or do not exist.

Moving to an Organized Level

- Begin investing in improving analytics capabilities of organization. At this stage, aim to move from summary reports to descriptive analytics.
- Begin to integrate data as part of the decision making process and as a tool used to produce work more efficiently and effectively.
- Begin to document data and build a business glossary for each department of an organization.



4.2 Data Strategy | Organized

People

Data use is still ad-hoc and lacks coordination, resulting in quality issues limiting its usefulness. Some pockets of the organization use data, but because most is poor quality, it is not used in decision making. There is a lack of coordination and leadership around improving data capabilities. Data is more maintained rather than managed. Data teams are not integrated into business operations; data professionals are often in scattered, homogeneous teams throughout the organization. Personnel in charge of data spend most of their time on data maintenance, data cleansing, and report production. Program managers and system owners take accountability for data sets inconsistently based on projects. Program staff work with technical staff on incremental policy and data management improvements based on specific business needs or project assignments. The workforce is now beginning to become more data literate, with the ability to speak, write, and engage in data and analytics programs and use cases, paired with marginal employee capability to explain all aspects of an analytics case.

Technology

Data is leveraged with descriptive analytics that helps compare data and metrics across time periods. Data collection has advanced to provide ample transactional or line-item data to create metrics or compare data points. This type of analytics provides hindsight and answers “what happened?”. However, reporting efforts still focus on the “what” and “when” questions, regardless of data quality or causes of poor data quality. Data is still stored in siloed systems, however data can now be programmatically accessed. This allows some departments in an organization to use data for decision making on a regular basis.

Data Management

Data is still stored in silos where some documentation exists but standards are not regularly applied. In turn, data is unable to be shared within a team or across an organization. Business terms added to a business glossary are defined for a particular purpose and logical data models are created with reference to the defined business terms. A business glossary defines the relationship between business terms and their underlying metadata for faster analysis and enhanced decision-making. Metadata documentation is developed, stored, and accessible for certain teams or

Moving to a Digitized Level

- Begin to analyze data using diagnostic analytics rather than descriptive analytics.
- Begin to remove siloed data teams and hire data professionals that will now start to be integrated into business operations.
- Increase efforts to have data sharing policies common place within the departments of an organization



4.3 Data Strategy | Digitized

People

Within the departments, it has become routine to use data and analytics to an increased level. The organization has a presence of high performing teams that transform quality data into applicable information which supports decision making. There is a defined data strategy in the respective key assets of the different departments within the organization that also implement data quality requirements. Additionally, professional development training and career paths for data professionals are being established to advance skill sets. Highly trained data professionals are hired into organizations and use their skills to help solve operational and mission challenges with complex analytics. Leadership takes an active role in organization-wide data sharing policy, data management, and improvement initiatives. For example, initiatives may include following data lifecycle management processes and establishing a review and evaluation process for continuous improvement. Looking at data literacy, the workforce is now competent in designing, developing, and applying data analytics programs to most tasks.

Technology

Analytics is applied using diagnostic analytics which helps organizations better understand operational functions. Organizations have built out their data collection and analytics capabilities to conduct more sophisticated analyses that can identify root causes of poor performance or operational problems in real time. Diagnostic analytics provides insight to answer “what is happening?” and “why did it happen?” There are now common data systems that allow data to be programmatically accessed. Data is used as an asset for some common systems at the department level from human resources to executive leadership.

Data Management

Data is now managed across the organization with uniform documentation and increased application of standards. Common intra-department data categories and data element definitions are defined. This may include incorporating new data development, integration, and consolidation efforts. Additionally, data requirement processes, such as applying standard business terms and using metadata, are used to perform impact analysis on potential data changes.

Moving to a Connected Level

- Continue to invest in the analytics capabilities of an organization. Efforts should be made to provide predictive analytics that provides insight to the decision-making process.
- Prioritize data-driven decision making across an organization from the grassroots level.
- Emphasize data operability initiatives to increase universal accessibility to data.



4.4 Data Strategy | Connected

People

There is now a high demand for data by leaders to drive strategic and operational decision making. Data is managed as a strategic asset across the organization; its quality becomes a priority and is constantly monitored and measured. Data quality strategy is followed across the organization, accompanied by corresponding policies, processes, and guidelines. Looking at data personnel, data professionals are now integrated with subject matter experts. For example, the organization will designate a data executive, accountable for ensuring proper integration of data professionals throughout the organization to tackle complex intra-department challenges and deliver actionable reports. The governance structure includes widespread involvement and an increased following of policies. The workforce is fluent in data literacy across designing, developing, and applying data analytics programs across most business domains.

Technology

Predictive analytics is now used to help forecast the impact of current policies and decisions. Organizations use algorithms and complex data models to provide scenario-based decision making to support and predict the impact of decisions and policies. Predictive analytics answers “what will happen given our trajectory?” Technologically, there are some common data systems where key data can be programmatically accessed, supplemented with the usage of advanced technologies. Organizations are leveraging shared services as established by Federal Enterprise Architecture (FEA) goals and increasing the ROI by becoming more efficient with data management and analysis.

Data Management

Overall, data is managed with cross-functional applications in mind, where documentation is uniform and standards are regularly applied. Cross-functional data models, dictionaries, and taxonomies are defined for robust data management. Where possible, common inter-department data categories and element definitions are defined to support objectives. Compliance monitoring processes are used to verify proper data use. In addition, a business glossary is integrated into the organization’s metadata repository with appropriate access permissions and is used by the organization in development items such as shared repositories, data transfer standards, and semantic models. A metadata management strategy for the organization is established, managed, and maintained by data governance with input from stakeholders.

Moving to a Optimized Level

- Put in place the use of cross-functional prescriptive analytics that allows for optimized outcomes when performing decision making processes.
- Create multidisciplinary teams that transformatively leverage data across different horizontals.
- Move from implementing current tools and into exploring new and innovative data strategy methods



4.5 Data Strategy | Optimized

People

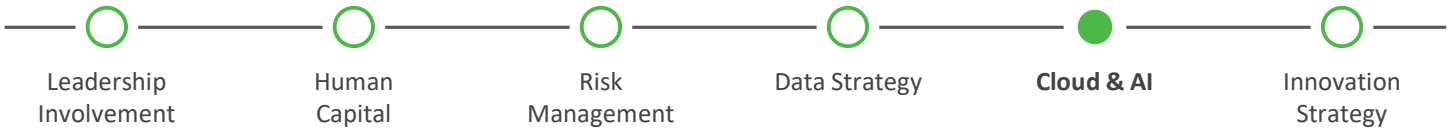
It is typical for analysis and best practices to now be shared across inter-department data communities of interest; data personnel establish data communities to help build out a pervasive data culture. Employees are educated at all levels and are improving capability throughout the organization and with other departments. Multidisciplinary teams are now solving operational challenges using data. Fully integrated and multidisciplinary teams are using data as a strategic asset across functions to drive decision making at all levels of the organization. There is an evident presence of organizational governance providing for increased participation in developing data standards and solutions. A data executive can drive continued advancement by sharing best practices, promoting smart organization-wide data policy, establishing standardized data quality metrics, and leading organization-wide improvement and standardization efforts. The workforce is fluent in data literacy across designing, developing, and applying data analytics programs across multiple business domains, industries and ecosystems, with full comprehensive and explanatory abilities for individuals who may be new to data.

Technology

Analytics has reached its optimized stage due to the application of cross-functional prescriptive analytics. Prescriptive analytics are used to optimize and influence outcomes, utilizing sophisticated models backed by multiple data sources. Prescriptive analytics answers “how can we make it happen?” or “how can we optimize what is already happening?” At this point, there are core common data systems that allow key data to be programmatically accessed, and common tools are in continuous use across the organization. When it is relevant and mutually beneficial, organizations leverage shared platforms to continue to improve efficiency while considering data standards, protocols, and application programming interfaces (APIs). Organizations are also constantly looking for ways to innovate and discover new solutions to advance the data strategy.

Data Management

At the optimized level, data is managed while considering organization-wide needs where documentation and standards are uniformly applied. The organization has developed an integrated metadata model deployed across all platforms. There is fully standardized mission support and asset management data across the organization to conduct a full range of performance benchmarking and analysis. Mission data is standardized by domain and shared where common programs and mission objectives dictate. The business glossary uses dynamic and up-to-date industry business terms and definitions as appropriate, and is integrated into the organization’s metadata repository.



5 Cloud & Artificial Intelligence

Cloud computing and artificial intelligence (AI) are core tenets for disruptive organizational changes in response to the increasing prevalence of digital functions. Both cloud and AI offer transformative benefits enabling teams to rethink processes of integration and analysis of data. Widespread adoption results in valuable insights and, in turn, enhanced decision making. The digital maturity levels of cloud and AI describe the integration and usage within an organization, in addition to the various factors that contribute to the eventual optimized adoption of the technologies. The following section details both *Cloud Integration and Usage*, as well as *AI Integration and Usage* as divisions for the criterion.

Metrics

Usage

Ultimately, cloud and AI integration is crucial as organizations begin to grow in this technologically advanced world. Usage is an imperative metric to evaluate whether both technologies are being implemented and utilized effectively. To further quantify utilization, metrics such as service availability, reliability, and response time can be assessed to detail the success of cloud and AI integration. Service availability and reliability is realized through initial research, whereas response time is measured by continuous testing and documentation. In many cases, although integration is completed, there is a lack of effective utilization; consequently, the necessity for the service to be applied is a large factor in how involved and advanced a conglomerate wishes internal cloud and AI technologies to be.

Return on Investment

Return on investment is focused on the return of value derived from cloud and AI investments. It is imperative for organizations to assess the value of implementations to assess both the benefits and drawbacks, allowing for comprehensive decision making to increase efficiency. Within cloud and AI, ROI can be measured by evaluating monetary changes, effects on team efficiency, and the speed-to-value, among other quantifiable key performance indicators. Taking a more granular approach, organizations can assess implementation by considering measures such as training costs, development costs, and time requirements. In contrast, the value-add can be quantified by taking into account measures such as the impact on efficiency and long-term cost savings.



5.1 Cloud & Artificial Intelligence | Limited

Cloud Integration and Usage

In this stage, the organization has no relationship with cloud technology. Integration has not begun the planning stage, and in turn there is no usage of any cloud service within the organization. Budgeting may not have allotted an adequate amount of funds towards the progress of this integration which has resulted in no foreseeable plan of purchase and utilization. If anything, beginning stages of research has begun to answer if cloud computing is necessary for the organization, and what services will be used by the organization to transition into the cloud system realm.

AI Integration and Usage

At a limited level, organizations begin to form questions and address the opportunity of introducing AI solutions. There may be little to no budget and a lack of a formal plan. However, teams within the organization begin to explore trends and evaluate the costs, benefits, risks, and business value of implementing AI. Organizations may reach the point of researching AI opportunities and forming an initial roadmap of the work required to integrate the technology; however, most entities are only aware of the technology. Individuals or teams may begin experimenting with AI for the purpose of learning and building internal awareness, but there is a lack of sophisticated use to drive business goals.

Moving to an Organized Level

- Begin researching which cloud systems will be useful for the progression of the organization, comparing the costs, uses, and functions of each; slow implementation is expected.
- Begin transforming initial discourse to meditative approaches in researching implementation strategies, considering development techniques, and evaluating the value-add.



5.2 Cloud & Artificial Intelligence | Organized

Cloud Integration and Usage

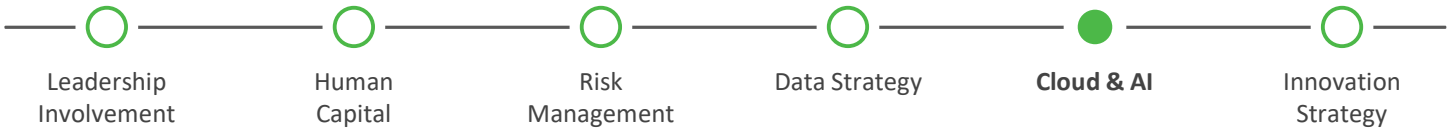
Cloud technology is being explored and utilized in internal organizational projects or processes. Large scale implementation of the technology is not yet present, but strides are being made to ensure that the organization understands the entirety of how cloud computing and cloud systems function. The organization has started to research and understand which systems are necessary, and which approach to take. Further research, budget allotment, and integration is necessary to advance digital and business operations to the next stage, as in totality, this will produce a defined plan to ultimately utilize cloud technology properly and fully within the organization.

AI Integration and Usage

In this stage, the organization begins serious efforts in exploring AI solutions. This may consist of leadership looking into pilots and proof of concepts (POCs); POCs include consideration of AI software vendors or implementation within internal teams. Additionally, teams begin building momentum to integrate AI solutions, and hypotheses are tested regarding the value that can be generated from implementing AI; however, most involvement with AI largely surrounds technical teams, with little engagement from business units.

Moving to a Digitized Level

- Begin to utilize the collective understanding of internal cloud usage and scale to larger projects by slow integration and usage with concurrent testing and planning.
- Progress from the exploration stage to deploying at a relatively small scale, supplemented by follow-up testing, iterations, and formal roadmapping for large scale implementation.



5.3 Cloud & Artificial Intelligence | Digitized

Cloud Integration and Usage

Cloud technologies have been used in larger projects within the organization. Integration has spanned to nearly half of planned cloud systems, those of which are fully deployed and utilized in a proficient manner within the organization. Planning for large scale deployments internally and externally has begun. Further planning of future integration continues, and the possibility of multiple cloud services within the organization is present.

AI Integration and Usage

Organizations see successful deployment of initial AI solutions, typically as pilot projects. Solutions are defined in terms of the business value, internal risk policies, relevant software tools, and appropriate processes. Proper testing and experimentation of the solutions in production are leveraged to analyze outcomes to iterate for larger scale deployment. Increased budgets and plans are devoted to ensure the long-term maintenance and expansion of AI models. Aside from technical teams, there is greater involvement from business units in understanding the value of AI and the prospect of further cross-functional implementation.

Moving to a Connected Level

- Start to utilize nearly every feature of all integrated cloud systems in day-to-day operations, where previous planning and testing continues.
- Take strides to elevate initial deployment to scale solutions at a larger level, while also gathering metrics, evaluating the business value, testing the solutions, and implementing guidelines for use.



5.4 Cloud & Artificial Intelligence | Connected

Cloud Integration and Usage

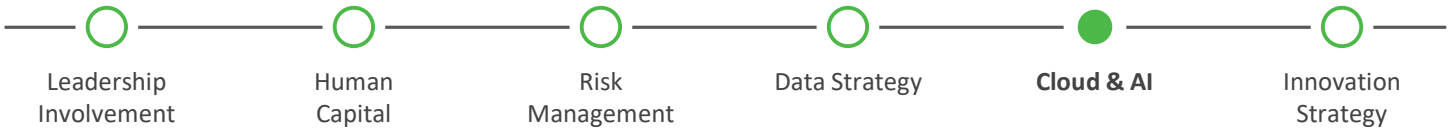
Cloud technologies are utilized in day-to-day operations within the organization, alongside large-scale projects across all departments. Majority of cloud systems have been properly and successfully deployed, and the organization has begun planning for final full-scale deployment and usage of cloud systems. Justified planning for the future integration is complete, and multiple internal and external projects are integrated and utilizing cloud systems to a great extent.

AI Integration and Usage

AI solutions are scaled to an enterprise level in which products and services, both internally and externally, are applying AI. There is at least one solution delivering metrics indicating a clear ROI and added business value. As the deployed applications increase, an iterative process ensures increased efficiency and cost savings. The complexity of the AI models may increase, resulting in increasing challenges, in which case added infrastructure and programs will need to be integrated to tackle the larger scale. Regardless, integration of solutions is driven across the organization and there are formal guidelines in place to ensure responsible use. There is also widespread interest in AI solutions, with business units beginning to make data-driven decisions based off of the solutions, such as predictive modeling.

Moving to an Optimized Level

- Utilize cloud technologies to be present within all areas of an organization, where cloud systems are present to improve overall operational efficiency.
- Leverage AI to be involved with all parts of the organization to optimize decision-making and automate processes, in addition to applying an innovative mindset to increasingly adopt AI.



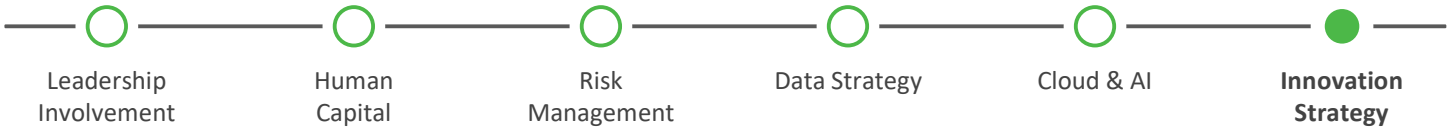
5.5 Cloud & Artificial Intelligence | Optimized

Cloud Integration and Usage

Full-scale deployment is essentially complete, with the wanted cloud systems and technologies fully integrated, understood, and utilized by most, if not all, factions of the organization. Ultimately, business operations are fully run through the cloud, and cloud-based systems are in full function for all operations within an organization. Organization understanding and continual development of newer cloud technology is continually on the rise, and planning for upgrading and updating systems is complete for the foreseeable future.

AI Integration and Usage

The organization has not only enabled AI to have an active role within the organization, but is leveraging the solutions to automate business processes and drive strategic decisions, not limited to internal operations. Silos are broken down to integrate AI into all parts of the organization, with a universal adoption of AI literacy. In turn, AI consistently has a role in decision-making across the organization. The technology is a high priority in budgeting and future roadmaps. Executives base a majority of decisions on insights generated from models and the future strategies of the organization largely encompass decisions sourced from AI.



6 Innovation Strategy

Innovation is one of the key determinants in gauging competitive advantage and achievement. A myriad of organizations succeed today, but the clear leaders in industry embrace continual digital advancement. Innovation refers to the concept of an organization undertaking new products, processes, ideas or approaches to existing products, in new distinct ways. In the world of business, innovation helps organizations grow, remain competitive, and increase differentiation. To understand the value added by innovation, *Organizational Capability* and *Growth Strategy* are fundamental descriptors to take into account.

Metrics

Training

Innovation begins with innovative people. The level of training an organization promotes is indicative of an institution that is attempting to bolster the capabilities of their workforce. To foster increased credibility and advancement of organizational capabilities, internal and external training resources allow for a more modernized and efficient workforce. Effective training can be quantified by evaluating the number of hours spent in training, the number of training courses offered related to enhancing digital acumen, and the level of skills expanded as a result of training efforts.

Investments

Developing more growth opportunities is instrumental in an organization's ability to continuously innovate. The level and type of investments are integral to transform business objectives digitally. Respectively, increased investments constitute a need for capital intended for research and development (R&D) purposes. The duality of implementing investments in addition to contributing R&D efforts is an indicator of the weight innovation is given within an organization. This metric can be quantified to include how many investments are made towards bolstering innovation capabilities, in addition to how many types of investments are made and whether the investments are progressed towards R&D phases.



6.1 Innovation Strategy | Limited

Organizational Capability

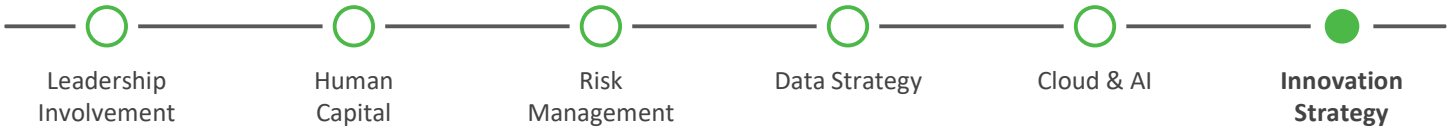
At this level, there is little to no initiative for creating and maintaining an environment for innovation. There is a lack of focus directed towards providing training to cultivate practical skills within the organization. The shortcomings in programs promoting training and awareness leads to a lack of idea generation and development efforts, ultimately exhibiting inadequate capabilities, unprepared for developing and implementing cutting edge technologies.

Growth Strategy

For the limited stage, no roadmaps or detailed plans have been developed to strategize innovation within the organization. There is no budget allocation for the assessment and enhancement of the innovation portfolio. Research of new and advanced technologies has not begun, resulting in an inefficient use of resources. More so, no formal processes or methodologies have been introduced to foster digital innovation.

Moving to an Organized Level

- Incorporate training programs to increase awareness and develop the necessary skills within the organization to ideally ideate, develop, and implement innovative solutions.
- Implement a framework going forward that indicates necessary resource allocation for the purpose of enhancing the overall innovation portfolio.



6.2 Innovation Strategy | Organized

Organizational Capability

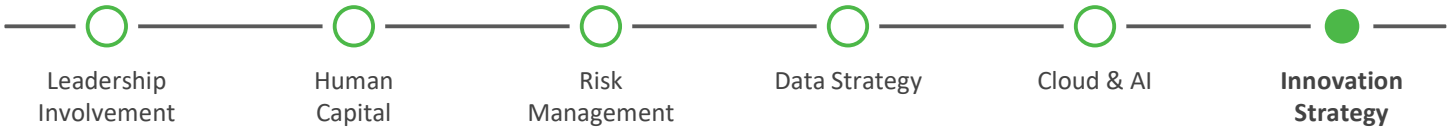
More focus has been placed on innovation in the organized stage. Planning for an established environment for fostering innovation has begun where an emphasis on innovation initiatives is marginally present. Skills and training required for adopting innovative technologies is delineated, but has not been enforced internally. Implementation of an innovative framework is small-scale and incapable of horizontal integration.

Growth Strategy

At an organized level, an increase in discourse surrounding innovation strategy is observed. This facilitation of conversation paves the way for increased budget allocation towards researching ideas to consider developing products internally or adopting external products. The expansion of research efforts allow for the ability to develop initial roadmaps to strategize the potential adoption of researched technologies, intended to meet organizational objectives.

Moving to a Digitized Level

- Facilitate more training opportunities to allow a more diverse skill set while applying these new skills towards improving the current innovative capabilities.
- Improve the initial roadmapping efforts to finalize a path forward while continuing to ramp up budgeting towards innovation related efforts.



6.3 Innovation Strategy | Digitized

Organizational Capability

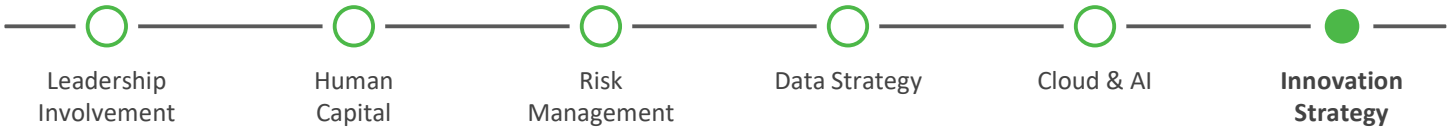
At a digitized level, efforts to enforce widespread training is observed, allowing for trailblazers to broaden professional skill sets and adopt an inventive mindset. Across the organization, individuals are applying these newfound skills to pioneer in the field by innovating visionary ideas which are formally researched and designed. Adoption of these novel propositions has not been achieved, but increased training is promoting future capabilities to implement technologies, further advancing organizational objectives using innovative measures.

Growth Strategy

Initial strategies are now developed in the form of fleshed out roadmaps, detailing operational goals and respective innovative investments to meet these goals. Strategies consider both internal and external investment possibilities, in addition to initial talks of establishing processes, guidelines, and a monetization model. This increased sophistication in formal planning is complemented by a pivot in budgeting, exhibited by expanded funding plans for innovative activities.

Moving to a Connected Level

- Increase training efforts, both in the quantity and rigor of instruction. Begin translating the skills attained to demonstration of product research, development, and implementation.
- Advance preliminary roadmaps by not only adopting strategies, but applying them to further organizational goals and integrate innovation by adopting budget plans and acquiring resources.



6.4 Innovation Strategy | Connected

Organizational Capability

In the connected phase, implementation of new skill sets and training is highly prevalent within the organization. Groups are employing these skills into state-of-the-art innovative research processes and development, and further adopting advanced ideas into practice. Overall technological innovation advancement is expansive, with further outlining for research and development to facilitate further innovative maturity.

Growth Strategy

Adoption and application of strategic roadmaps has begun, where further developmental goals are continually added as advanced technologies and knowledge is integrated into the organization. Innovational strategy is clearly defined, and the organization has a detailed structure to emphasize the importance of innovation. Budgetary changes are more prevalent, and an increased fraction of organizational funds are allocated towards the continual strategic improvement of future innovative plans, alongside acquisition of tools, skills, and knowledge to propel new innovation standards.

Moving to an Optimized Level

- Complete full-scale, widespread integration of innovative projects, ideas, and knowledge to progress continual innovation to a new level
- Fully develop long-term, defined, and explicit roadmaps to detail strategy on new research, development, technology, skills, and budgetary standards



6.5 Innovation Strategy | Optimized

Organization Capability

At the optimized level, refining the implementation of new skill sets is a top priority. Being able to properly utilize the new skills in an efficient and effective manner allows for an increase in productivity as the organization elevates from connected to optimized. Simultaneously, research and development efforts have pivoted towards the new wave of innovative technologies that will continue the established innovation going forward. Organizations at the optimized level will have dedicated spaces for technology experts to continue driving innovation internally.

Growth Strategy

At this point, development is continuously improving and pivoting as new technologies are introduced and implemented. The budgeting model used is adaptable and accounts for a constantly evolving innovative ecosystem. A clear roadmap is in place to introduce and bring about new technologies in their infancy to fully mature and leverage them going forward. Innovation is a top priority at this time, and defines the main method of growth an organization will use to drive increased productivity.

Thinking Forward

The path towards digital maturity is an ongoing process that requires an organization to continuously strive to be at the forefront of digital initiatives. Though it may be an intensive process, digital maturity advances organizations with improved efficiencies and data-driven decision making. Digitally mature organizations take into consideration the long-term risks and benefits of technology to better define objectives. According to the Boston Consulting Group, organizations in certain sectors (2018) have lagged behind on taking advantage of the improvements digitalization can offer in areas such as productivity, cost efficiency, and innovation. Strategic thinking and planning to anticipate for future advancements is imperative to achieving digital maturity.

The process of becoming digitally mature is rigorous, requiring leadership to continuously iterate on ideas and revamp operations. In order to achieve digital maturity, it is imperative that a culture is put in place by leadership that commits to making digital transformation an integral part in an organization. Having this as a priority and tying digital growth to the organization's core business strategy is key in demonstrating the paramount importance of digital maturity. To fully embrace digital maturity, leaders must strive to build an organizational culture that embraces risk taking, experimentation, and collaboration. Besides this, having strong human capital is crucial for an organization as it means having a workforce that is efficient in delivering its optimum productivity as ultimately an organization is only as strong as its weakest links. Utilizing technologies such as cloud and AI and having a strong data strategy, in addition to a comprehensive risk management plan, are just as important as it provides beneficial insight and allows for confident decision making to take place. Agile teams that work in short sprints to experiment with innovative digital initiatives should also be in place to increase functionality and production in a more cost-effective manner.

An organization should identify at which stage of maturity it is located within the six respective areas highlighted in this white paper: *Leadership Involvement, Human Capital, Risk Management, Data Strategy, Cloud and Artificial Intelligence, and Innovation Strategy*. This will help identify an organization's digital strengths and areas that need increased attention. The framework put forth in this document acts as a guide to progress across levels, improving digital capabilities and organizational infrastructure. It is important to note that this framework is not a "one size fits all" as depending on individual circumstances and objectives; for example, organizations may find it more effective to reach a connected level, rather than incorporating transformative strategies at an optimized level. For areas which have reached an optimized level, initiatives can still be implemented to advance further. Some examples of this would be continuously encouraging the sharing of knowledge between teams to ensure that AI and data is accessible to all, continuing to streamline development tools and computing resource management, and defining innovative new use cases that push the boundaries of existing technology, to name a few. Using a digital maturity framework provides key milestones that can help organizations have a clearer picture of their current state and future objectives, whether it be at the limited or optimized stage, thus ensuring relevant areas are not neglected.

References

- Baig, A., Hall, B., Jenkins, P., Lamarre, E., & McCarthy, B. (2020, May 14). The COVID-19 recovery will be digital: A plan for the first 90 days. Retrieved November 30, 2020, from <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/the-covid-19-recovery-will-be-digital-a-plan-for-the-first-90-days>
- Bauer, H., Scherf, G., von der Tann, V., & Klinkhammer, L. (2019, March). Perspectives on transforming cybersecurity. McKinsey & Company. https://www.mckinsey.com/~media/McKinsey/McKinsey%20Solutions/Cyber%20Solutions/Perspectives%20on%20transforming%20cybersecurity/Transforming%20cybersecurity_March2019.ashx
- The Competitive Advantage of Digital Champions. (2018, July 05). Retrieved December 07, 2020, from <https://www.bcg.com/publications/2018/infographic-competitive-advantage-digital-champions>
- Cresswell, K., Sheikh, A., Krasuska, M., Heeney, C., Franklin, B. D., Lane, W., . . . Williams, R. (2019). Reconceptualising the digital maturity of health systems. *The Lancet Digital Health*, 1(5). doi:10.1016/s2589-7500(19)30083-4
- D. (2018). Digital Maturity Model. Retrieved December 05, 2020, from <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Technology-Media-Telecommunications/deloitte-digital-maturity-model.pdf>
- Data Strategy for the U.S. Department of Justice. (2019, February). Retrieved December 07, 2020, from <https://www.justice.gov/jmd/page/file/1135081/download>
- Department of Justice Information Technology Strategic Plan. (2019). Retrieved December 07, 2020, from <https://www.justice.gov/jmd/page/file/1141946/download>
- DHS Digital Strategy. (2020, November 20). Retrieved December 07, 2020, from <https://www.dhs.gov/dhs-digital-strategy>
- The Digital Maturity Model 4. (n.d.). Retrieved December 5, 2020, from <https://forrester.nitro-digital.com/pdf/Forrester-s%20Digital%20Maturity%20Model%204.0.pdf>
- Díaz, A., Rowshankish, K., & Saleh, T. (2018, September). Why data culture matters. Retrieved December 09, 2020, from <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Analytics/Our%20Insights/Why%20data%20culture%20matters/Why-data-culture-matters.ashx>
- Digital Maturity Self-assessment – data model/structure. (n.d.). Retrieved December 05, 2020, from <https://www.england.nhs.uk/publication/digital-maturity-data-model/>
- Digital Transformation Assessment: Resilience & Performance in a Digital World. (n.d.). Retrieved December 05, 2020, from <https://landing.protiviti.com/digital>

References

- Dorville, K. (2014, August 4). Department of Homeland Security Cybersecurity Capability Maturity Model White Paper. Retrieved December 07, 2020, from <https://niccs.us-cert.gov/sites/default/files/Capability%20Maturity%20Model%20White%20Paper.pdf?trackDocs=Capability%20Maturity%20Model%20White%20Paper.pdf>
- EPA Digital Strategy. (2020, November 17). Retrieved December 07, 2020, from <https://www.epa.gov/data/digital-strategy>
- Farhan, R. (2020, April 20). Why are business glossaries so important in data? Retrieved December 07, 2020, from https://em360tech.com/business_agility/tech-news/opinion-piece/business-glossary-benefits
- Flott, K., Callahan, R., Darzi, A., & Mayer, E. (2016). A Patient-Centered Framework for Evaluating Digital Maturity of Health Services: A Systematic Review. *Journal of Medical Internet Research*, 18(4). doi:10.2196/jmir.5047
- George Westerman, D. (2012, November 20). The Advantages of Digital Maturity. Retrieved December 07, 2020, from <https://sloanreview.mit.edu/article/the-advantages-of-digital-maturity/>
- Hochmuth, C. (2014, August 7). EPA's cloud computing conundrum. Retrieved December 07, 2020, from <https://fcw.com/articles/2014/08/07/epa-cloud-computing-conundrum.aspx>
- Khanbhai, M., Flott, K., Darzi, A., & Mayer, E. (2019). Evaluating Digital Maturity and Patient Acceptability of Real-Time Patient Experience Feedback Systems: Systematic Review. *Journal of Medical Internet Research*, 21(1). doi:10.2196/jmir.9076
- Lambers, E., Goedhart, B., Drs., & Madlener, J. (2019, January 08). How to become data literate and support a data-driven culture. Retrieved December 08, 2020, from <https://www.compact.nl/articles/how-to-become-data-literate-and-support-a-data-driven-culture/>
- Ramakrishnan, K., & Salveson, C. (2020). The AI Maturity Framework. Element AI. https://s3.amazonaws.com/element-ai-website-bucket/AI-Maturity-Framework_White-Paper_EN.pdf
- Savkin, A. (2020, October 21). KPIs for Big Data Initiatives. Retrieved December 07, 2020, from <https://bscdesigner.com/kpis-for-big-data.htm>
- Secretary, H., & (DCD), D. (2020, March 19). Digital Strategy. Retrieved December 07, 2020, from <https://www.hhs.gov/web/governance/digital-strategy/index.html>
- Sternkopf, H., & Mueller, R. M. (2018). Doing Good with Data: Development of a Maturity Model for Data Literacy in Non-governmental Organizations. Retrieved December 09, 2020, from <https://pdfs.semanticscholar.org/e033/7cf20cbf5623eebf05f013ddad17d1acaa79.pdf>
- Stoycheva, Z. (2019, December 24). The contemporary challenge: 4V's of Big Data. Retrieved December 07, 2020, from <https://blog.datumize.com/the-contemporary-challenge-4vs-of-big-data>

References

- Swann, R., & Coleman, T. (2019). The Federal Government Data Maturity Model. Retrieved December 07, 2020, from <https://my.usgs.gov/confluence/download/attachments/624464994/Federal%20Government%20Data%20Maturity%20Model.pdf?api=v2>
- Thompson, L. (n.d.). Assessing the Digital Maturity of the NHS. Retrieved December 05, 2020, from <https://emea.gehealthcarepartners.com/insights/17-digital-and-advanced-analytics/524-assessing-the-digital-maturity-of-the-nhs>
- Wenger, J. B., Koehler, R. K., & Willis, H. H. (2019). An Analytic Inventory of DHS Headquarters Business Processes. Retrieved December 07, 2020, from https://www.rand.org/content/dam/rand/pubs/research_reports/RR2600/RR2652/RAND_RR2652.pdf