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TOGAF®, an Open Group Standard, and Enterprise Architecture Requirements

A White Paper by:

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Executive Summary

For as long as we can remember, the idea of business requirements has been one of the most contentious issues between IT and business stakeholders. To resolve this conflict, many disciplines have emerged, but progress towards its resolution has been minimal. Business stakeholders often express business requirements as characteristics of the solution; for example, we need a CRM that can help automate these processes, the look-and-feel must be like so, and we need all of these reports. The IT organization stakeholders build information systems based on the business requirements provided, but the system often fails to address the entire business opportunity. The business opportunity in the case of a CRM project is that it needs to improve customer satisfaction, increase the rate of referrals, and hence reduce costs of acquiring and/or keeping current customers. In many of these cases the business outcome and business requirements appear to have no relationship. The re-definition of business requirements and their rework is often common-place in IT projects, which increases the time and costs of the project. This causes dismay to everyone involved and the results get marked as yet another failed IT project.

In this White Paper, we will describe how to overcome the business requirement chasm by leveraging the TOGAF standard. TOGAF, an Open Group standard, is a proven enterprise architecture methodology and framework used by the world's leading organizations to improve efficiency.

Introduction and Context

The lack of clearly defined and stable business requirements is frequently cited as the number one reason why delivery of IT projects often exceeds the originally planned timeline and cost and does not deliver on the business value. Much has been done to study and solve this problem [1]; the real progress to date has been limited. We believe there are several underlying and fundamental reasons why this lack of requirements has plagued IT projects:

- There is no clear vocabulary to communicate among all stakeholders.
- There is no accountability for business outcomes.
- There is no responsibility for the problem and solution definition.
- There is restrictive organization structure and politics.

We, at QRS, have studied this problem from a systems thinking [2] point of view. We discovered that the definition of business requirements is very vague and each discipline – such as strategic planning, enterprise architecture, solution architecture, project management, business analysis, IT service management, and value generation – have their own vocabulary, context, and perceived accountability and responsibility. As a result, the perceived value from the project by each stakeholder is different.

We studied the problem using the TOGAF standard. Our analysis of the current situation showed that the concept of business requirements must be studied from two points of view and then brought together:

1. **The Problem Space**: statements that describe the problem to be solved from all stakeholders' point of view.
2. **The Solution Space**: statements that describe the characteristics of the solution that will address the problem in its entirety.

In this White Paper, we will specify:

- What enterprise architecture requirements are
- How to elicit, analyze, and communicate them
- The roles, responsibilities, and skills required to elicit and analyze them

In addition, we will also define the relationship between enterprise architecture requirements, business requirements, system requirements, and organization change management requirements, and so on. Furthermore, this White Paper provides a partial set of enterprise architecture requirements for a major business transformation strategy: Bend the Health Care Cost Curve.

Enterprise Architecture Requirements

The concept of architecture requirements is recognized in the specification of the TOGAF 9.1 standard. The Requirements Management phase is: "a dynamic process whereby requirements for enterprise architecture and subsequent changes to those requirements are identified, stored, and fed into and out of the relevant ADM phases". This ensures traceability between architecture requirements and the output of subsequent phases of the TOGAF ADM.

The identified gap is that the TOGAF standard and other requirements management frameworks are silent on defining what exactly an enterprise architecture requirement is; that is, how to elicit and analyze the relationship between outputs of the phases of the TOGAF ADM and architecture requirements. Additionally, we will explore in this White Paper how various terms presumably defining business requirements relate to each other.

Elicit Enterprise Architecture Requirements

Figure 1 depicts enterprise architecture requirements as obstacles that prevent the required capability from performing at the target performance level. Furthermore, five steps below help define a sequence of events for how to define enterprise architecture requirements.

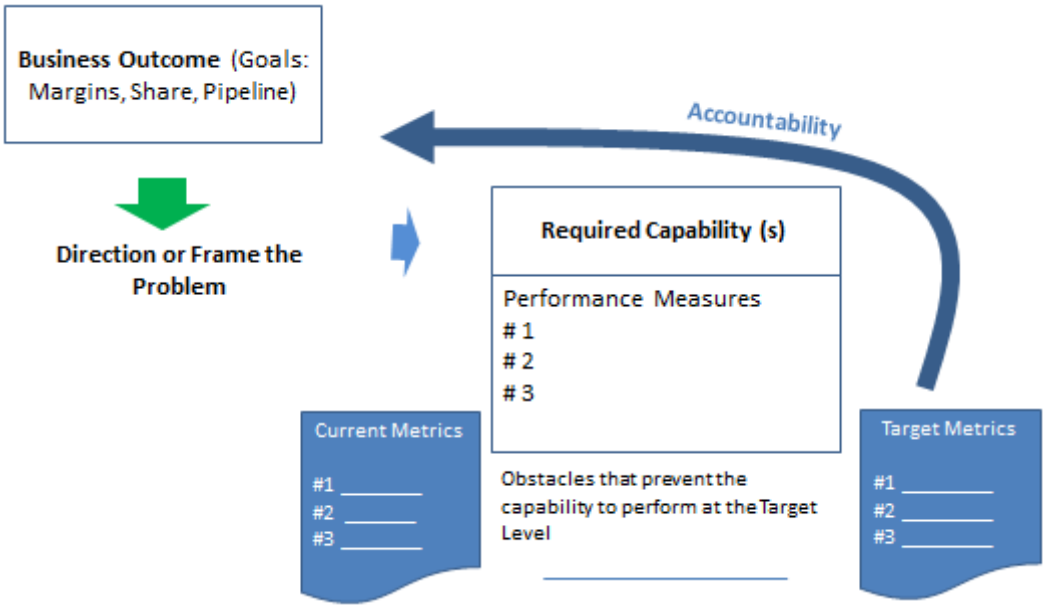


Figure 1: Enterprise Architecture Requirements

- **Step 1**: Understand the desired business outcome and describe it in terms of SMART[1] objectives.
- **Step 2**: Interview various stakeholders and review industry literature to understand how other organizations and industries have achieved the same results. If desired results have not been achieved to date, this is often referred to as a game-changing innovation.
- **Step3**: Validate consensus among all affected stakeholders that the business outcome is understood and

[1] SMART stands for: Specific, Measurable, Achievable, Relevant, and Time-bound.

direction to proceed is agreed; i.e., in Figure 1 "Frame the Problem".

- **Step 4**: In order to solve the framed problem, understand what enterprise and supporting capabilities must change and operate at the desired level of performance.
- **Step 5**: Meet the stakeholders and identify why the affected capabilities are unable to perform at the target level. The obstacles that prevent the affected capabilities from performing at the target level are referred to as enterprise architecture requirements; all other requirements are outputs of ADM phases.

Process to Analyze Enterprise Architecture Requirements

Using the TOGAF ADM, enterprise architecture requirements are fed into various ADM phases and are processed accordingly. The following is a brief description of the output of each ADM phase in the context of enterprise architecture requirements:

- **Phase A**: The architecture requirements describe a problem that may not be solvable; this may be referred to as a "wicked problem" [3]. The wicked problem frequently has no absolute solution, and can only be tamed. In this phase, the wicked problem is framed into what is solvable and simultaneously will address the essential aspects of the original wicked problem.
- **Phase B**: Considering the framed problem, this phase defines the improved business processes that the organization can implement (organization change management requirements) and will deliver the necessary improvements in the process. In IT, these are often referred to as business requirements.
- **Phase C**: This phase will make an effective process efficient by delivering the right information to the right person in a secure and reliable manner is an output; these are often referred to as system requirements.
- **Phase D**: This phase defines the infrastructure that will support the system and the infrastructure that will conform to all functional and non-functional requirements as well as to enterprise technology standards.
- **Phase E**: Considering the gaps between the current and to-be states, this phase defines the ideal and pragmatic transition plan. Enterprise architecture requirements are often expressed in terms of enterprise constraints, such as the speed at which the organization can absorb change.
- **Phase F**: This phase defines a list of approved work products that take into consideration all financial and non-financial constraints.
- **Phase G**: During the work package execution phase, inevitable choices force the implementation to make changes to the architecture. These changes need to be validated against the quality of outputs before they are made for expediency.
- **Phase H**: During the life of the enterprise capability, architecture requirements will be elicited from changes at the strategic, architecture, design, and/or configuration level.

Requirements Relationship

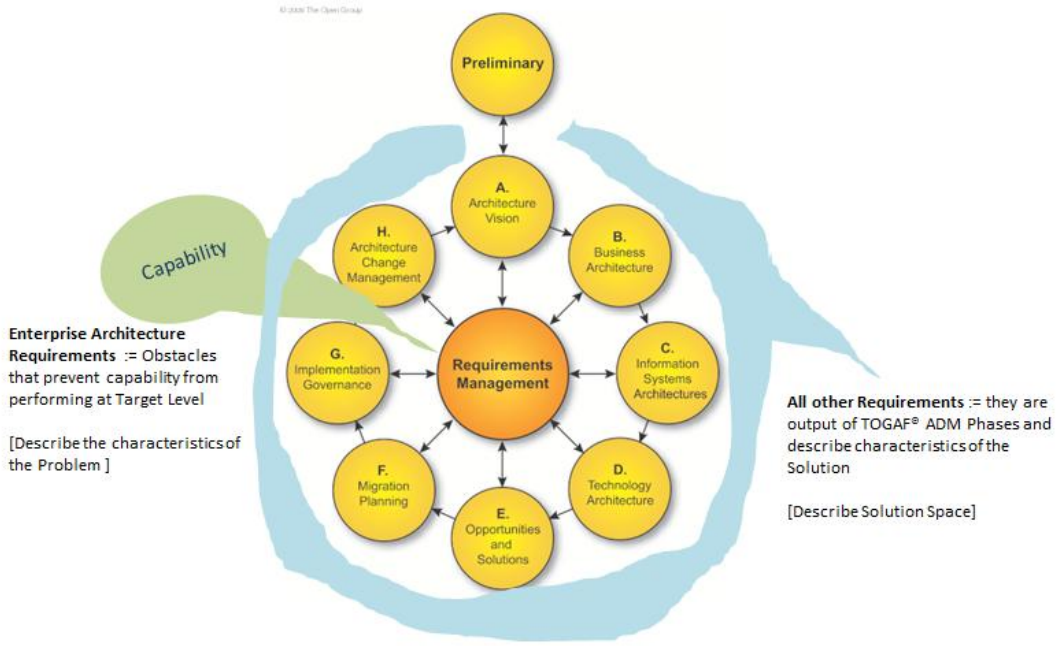


Figure 2: Requirements Relationship

Level of Abstraction

Since architecture development is an iterative process, the enterprise architecture requirements are also elicited and analyzed iteratively. There are many approaches for defining architecture iteratively.

The TOGAF standard defines architecture abstraction in terms of:

- Breadth (subject matter)
- Time
- Level of detail:
    - **Strategic**: defines architecture from the enterprise strategic intent
    - **Segmented**: defines architecture for one business strategy for change at a time
    - **Capability**: defines architecture for one capability at a time

The Zachman Framework [4] takes a different approach whereby it defines abstraction as:

- **Contextual**: Why are we undertaking this change?
- **Conceptual**: What must be changed in order to realize the benefits from the planned change?
- **Logical**: How is each relevant component to change?
- **Physical**: What tools and technologies will be required to change and manage the changed capability?

Both approaches to abstraction achieve the same business outcome. Additionally, the process by which enterprise architecture requirements are elicited, analyzed, and processed is also the same.

Example of Enterprise Architecture Requirements

The following case scenario and enterprise architecture requirements are provided to demonstrate how enterprise architecture requirements are elicited, analyzed, and communicated. By no means are these a complete set of enterprise architecture requirements for a complex business strategy.

Case Scenario

Bend the Health Care Cost Curve

About the Canadian Health Care System

Health care in Canada is delivered through a publicly funded health care system which is mostly free at the point of use but also has services provided by private entities. It is guided by the provisions of the Canada Health Act of 1984, whereby the government assures the quality of care through federal standards. The government does not participate in day-to-day care or collect any information about an individual's health; this remains confidential between a person and his or her physician. Canada's provincially-based medical care systems are cost-effective partly because of their administrative simplicity. In each province, each doctor handles the insurance claim against the provincial insurer. There is no need for the person who accesses health care to be involved in billing and reclamation. Private insurance is only a minimal part of the overall health care system.[2]

The Challenge

The cost of care is increasing at a rate that far exceeds growth in GDP and is unsustainable in the long run. Initial studies have shown that the focus on the following areas can help bend the health care cost curve downwards:

- Province-wide implementation of Ontario's existing Chronic Disease Prevention and Management Framework
- Implementation of leading practices in targeted areas
- Management of expenditure on physician services
- Management of expenditure on drugs
- Implementation of selected hospital human resource initiatives

As an Enterprise Architect, you have been asked to spear-head the implementation of leading practices in targeted areas to Bend the Health Care Cost Curve.

Architecture Artifacts

Business Strategy and Capability Map

Initial enterprise architecture requirements were elicited from the perspective of why changes are required and what must change in order to accomplish those changes.

The analysis of enterprise architecture requirements that were elicited through interviews with the CEO, Chief Medical Information Officer (CMIO), and several Ward Chiefs, as well as insights from multiple other industries, resulted in the proposed capability map, as outlined in Figure 2. It shows:

[2] Sourced and inspired from http://wikipedia.org.

- **Business Outcome**: Bend the Health Care Cost Curve with explicitly defined performance metrics.
- **Direction**: To improve the cost of care, the focus will be placed on quality of care delivery. In addition to the financial impact, this also affects the quality of life for the patient and working conditions for workers.
- **Deliver High Quality Care**: The ability to deliver high quality care (we call this an executive capability) consists of four sub-capabilities: (1) standardize and industrialize common practices; (2) create a learning organization; (3) real-time performance metrics; and (4) engaged patients and family (directive capabilities). For each capability, the performance indicators were defined and the impact of each sub-capability's performance on the overall capability's performance was assessed.
- **Delegation**: Subsequent work was assigned to other architects who developed the architecture roadmap for each directive capability. Architecture of each directive capability was then integrated as the overall Executive Capability and Roadmap for the Business Strategy.

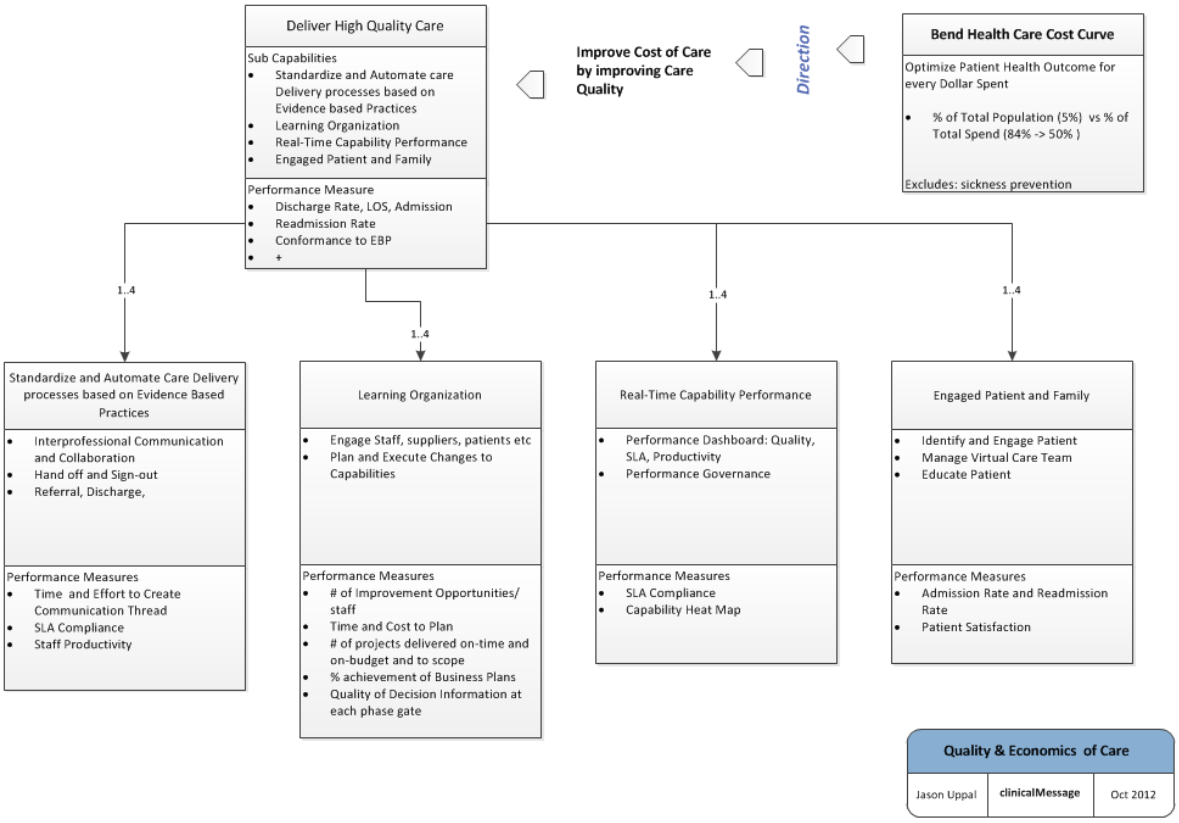


Figure 3: Strategic Architecture

Capability Map and Transition Plan

The transition plan for the learning organization below defines target measures at each transition phase which is the result of iterative architecture from both ideal architecture and pragmatic architecture points of view. The impact of each transition stage is then mapped onto the overall executive capability performance.

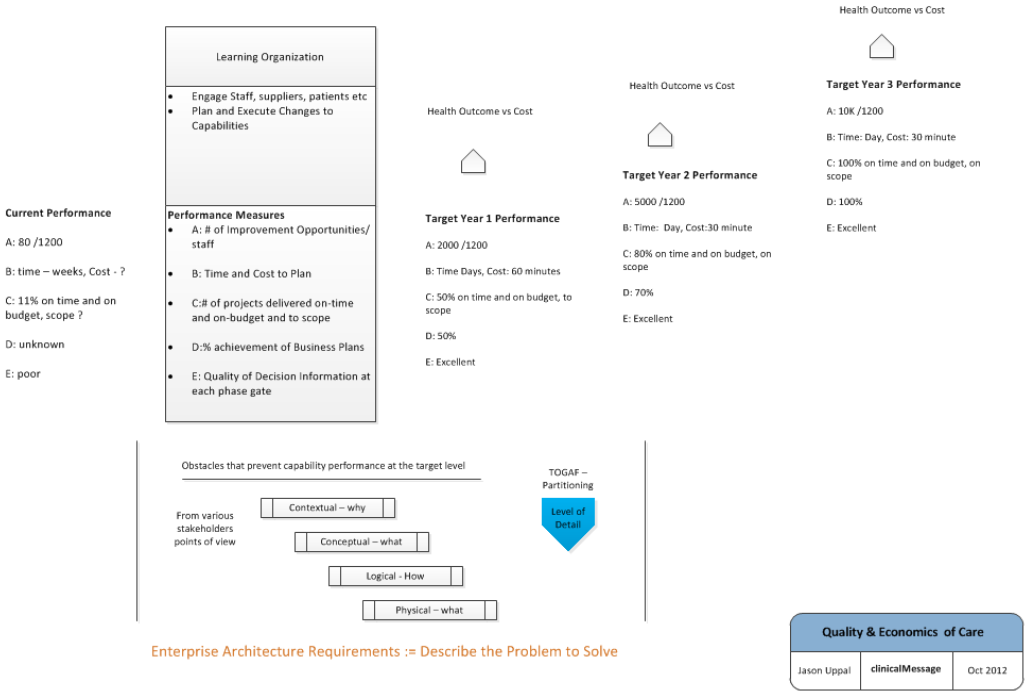
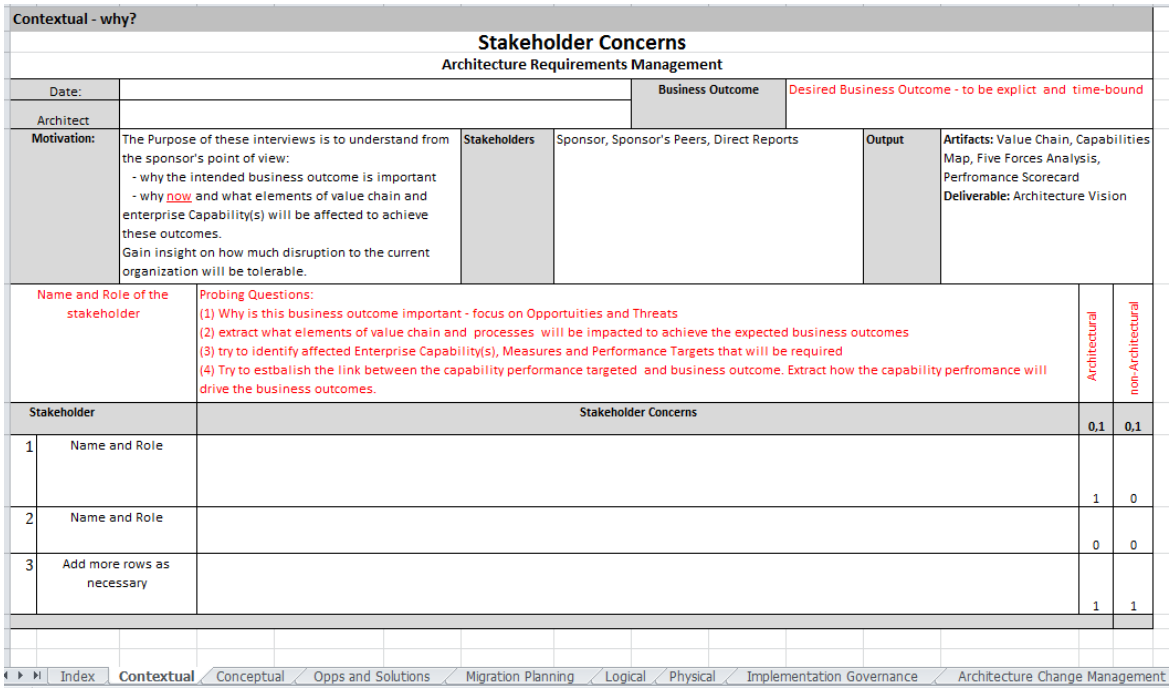


Figure 4: Proposed Transition Plan for a Capability

Architecture Requirements

Before a meeting to elicit enterprise architecture requirements was scheduled, we did extensive research and conducted many role-play workshops to ensure that we had a good understanding of the capability, performance measures, and tangible business objectives from the industry point of view.

We used the template (Figure 5) to elicit the enterprise architecture requirements. It provides a guideline of who should provide enterprise architecture requirements. This guideline was also dependent on the level of abstraction and probing questions that needed to be asked.



Contextual - why?

Stakeholder Concerns

Architecture Requirements Management

Date:		**Business Outcome**	Desired Business Outcome - to be explict and time-bound
Architect			

Motivation:	The Purpose of these interviews is to understand from the sponsor's point of view: - why the intended business outcome is important - why now and what elements of value chain and enterprise Capability(s) will be affected to achieve these outcomes. Gain insight on how much disruption to the current organization will be tolerable.	**Stakeholders**	Sponsor, Sponsor's Peers, Direct Reports	**Output**	**Artifacts:** Value Chain, Capabilities Map, Five Forces Analysis, Perfromance Scorecard **Deliverable:** Architecture Vision

	Name and Role of the stakeholder	Probing Questions: (1) Why is this business outcome important - focus on Opportuities and Threats (2) extract what elements of value chain and processes will be impacted to achieve the expected business outcomes (3) try to identify affected Enterprise Capability(s), Measures and Performance Targets that will be required (4) Try to estbalish the link between the capability performance targeted and business outcome. Extract how the capability perfromance will drive the business outcomes.	Architectural	non-Architectural
	Stakeholder	**Stakeholder Concerns**	**0,1**	**0,1**
1	Name and Role		1	0
2	Name and Role		0	0
3	Add more rows as necessary		1	1

Index | Contextual | Conceptual | Opps and Solutions | Migration Planning | Logical | Physical | Implementation Governance | Architecture Change Management

Figure 5: Architecture Requirements Template

After obtaining the perspective of all affected stakeholders, the summarized architecture requirements were presented into a final document as defined below. These architecture requirements can be expressed as in Table 1; these are only a partial set of requirements for the Bend the Health Care Cost Curve Capability (also known as http://clinicalMessage.org).

Table 1: Enterprise Architecture Requirements

Level of Detail	Stakeholder	Concern Expressed
Contextual [why]	Chief Medical Officer	To sustain the quality program we need all clinicians, patients, families, and suppliers engaged.
		People will get engaged if their contribution makes a visible difference.
Conceptual [what]	Nurse	It should be simple, easy, and accessible for people to suggest improvement opportunities, it has to be non-threatening, inclusive, and the life cycle of the suggestion must be visible.
		Define upfront the impact of change, roadmap cost, and the benefit that must be understood.
	Nurse Manager	Decision-makers must have confidence in the quality of information before investment decisions can be made.
	Head Resident	Need incremental implementation to keep all our staff together … results matter, but the journey is even more important.

Level of Detail	Stakeholder	Concern Expressed
	Enterprise Architect	If we map capabilities and their performance, we can deliver better quality roadmaps faster.
Logical [how]	Patient	It must be simple for me to add a suggestion and I want to know somebody is doing something with it.
	Advisor	Other people's feedback and assessment impact on key capabilities require that all information needs to be accessible. We need to sit with the lines of business and turn these ideas into capability assessments quickly.

Analysis of Architecture Requirements and Deliverables

Analysis of Contextual Requirements

You should follow through all phases of the TOGAF ADM and develop the Architecture Vision document, which at minimum should describe:

- The current situation and opportunity
- The direction considered and capabilities affected; consensus among all stakeholders
- The current and target capability performance
- The impact of the new capability performance on expected business outcomes
- The Statement of Work – work required to develop a detailed transition plan and business case

Output: Architecture Vision

- **Business Outcome**: Bend the Health Care Cost by focusing on the adoption of evidence-based practices.
- **Direction**: Improve the quality of care across the entire continuum of care for @Home, @Primary Care Office, and/or @ Hospital.
- **Capabilities**: Enhanced inter-professional communication, real-time performance, learning organization, patient and family engagement, industrialize leading practices, and create a culture of quality and safety.
- **Statement of Work**:
    - **Architecture Roadmap**: Timeline to realize in days (list of required competencies).
    - **Transition Plan**: Executed in a number of days (list of required competencies).
    - **Business Case**: Executed in a number of days (list of required competencies).
    - **Architecture Communication**: Executed in a number of days (list of required competencies).

Analysis of Conceptual Requirements

You should follow through all phases of the TOGAF ADM and develop the Architecture Roadmap, Transition Plan, and Business Case, which at a minimum should describe:

- **Roadmap**: Business, Data, Application, and Technology Architecture that considers what is possible.
- **Transition Plan**: Consider the organization's constraints to define the Transition Plan and scope of each

project, as well as its dependencies.

- **Business Case**: For each transition state, define the financial business case including cost, benefits, risks, and an independent validation of the architecture.

The award winning Capability, clinicalMessage™, was architected using this approach; please refer to: http://clinicalMessage.org.

Conclusion

Enterprise architecture requirements represent the characteristics of the problem to be solved. These requirements are elicited by the architect through industry research and interviews with affected stakeholders iteratively. Hence, it is the responsibility of the architect to ensure that all stakeholders are adequately represented and get a complete view of the problem.

Solution characteristics – which are often referred to as business, systems, non-functional, and organization change management requirements – are outputs of the TOGAF ADM process. These requirements are developed by the architect through a TOGAF ADM structured analysis of the current situation that is directed by the enterprise architecture requirements. It is the architect's responsibility to define these requirements.

In conclusion, the architect is responsible for understanding the complete business opportunity, defining the pragmatic solution, overseeing its implementation, and working with key business stakeholders to embrace the resulting capability to generate value. This will be critical in preventing the failure of IT projects.

About the Authors

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Jason Uppal's track record includes 20+ years of progressive experience in Hotel and Restaurant, Retail, Distribution, Manufacturing, Insurance, Finance, Healthcare, and Public Sectors. The primary focus of his assignments has been to streamline the current business processes through IT and non-IT solutions. His technical skills are well complemented by business acumen and people skills. He holds an undergraduate degree in engineering and post-graduate in business. Currently, he holds the position of Chief Architect with QRS.

Jason is a Level 3 (Chief Architect) certified IT Architect by The Open Group. He has contributed to the development of the Enterprise Architecture Framework release 8.1 and release 9.0. Currently, Jason is the chair of the TOGAF certification standing committee with The Open Group Architecture Forum and sits on the Open CA Level 1, 2, and 3 certification boards. He is a frequent speaker on Business Transformation Capabilities and Architecture of Complex Mission-critical Systems. He can be reached at Jason.Uppal@qrs3E.com.

Tamim Rahman, Enterprise Architect, QRS

Tamim Rahman has over 15 years of experience as an enterprise architect, project manager, manager, and consultant in information technology. In addition to a solid technical background and impressive experience in policy/procedure development and enterprise/solution architecture processes, Tamim has strong business acumen and excels in analysis of views and articulating cross-functional architectures. Tamim's work has ranged from Fortune 100 clients to small start-ups across multiple industries including Finance, Telecommunications, Public Sector, Retail, Utilities, Law Enforcement, Transportation, and Health Care. Most recently, Tamim has been working with The Open Group to further develop the maturity of the Enterprise Architecture (EA) profession, and has assisted with engagement deliverables and EA practitioner course development with QR Systems. In addition, Tamim has taught TOGAF and architecture courses to multiple public and private organizations in the last year.

Tamim has achieved TOGAF certification and carries the CISSP and CISM designations. Tamim holds a Bachelor's Degree in Computer Systems Engineering with distinction from Carleton University. He can be reached at Tamim.Rahman@qrs3E.com.

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Acknowledgements

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About The Open Group

The Open Group is a global consortium that enables the achievement of business objectives through IT standards. With more than 400 member organizations, The Open Group has a diverse membership that spans all sectors of the IT community – customers, systems and solutions suppliers, tool vendors, integrators, and consultants, as well as academics and researchers – to:

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