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Best Practices for Managing & Engaging Project Stakeholders

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INTRODUCTION

Effective stakeholder management and engagement is now acknowledged as a critical success factor on virtually every project. These assume heightened importance especially for large and complex construction and civil infrastructure development projects which usually tend to have numerous and diverse stakeholders spread over large areas. Effective project stakeholder management and engagement offers several significant benefits to projects, inter alia, reducing negative risks or threats to them, enhancing their design and planning quality and their execution efficiency, and often contributing towards attainment of a desirable win-win situation for both the projects as well as their stakeholders.

As awareness about the importance of good project stakeholder management and engagement has increased precipitously amongst project practitioners in recent year, many projects in construction and civil infrastructure development as well as in other fields have not only adopted sound established practices but are also showing an increasing inclination to experimenting with innovative ones. However, inadvertently or otherwise, it appears that many projects still exhibit serious stakeholder management and engagement shortcomings often resulting in mutually damaging and avoidable consequences for projects as well as their stakeholders. Hence, it is important to research existing best practices dealing with stakeholders in addition to proposing new ones and to generate and disseminate awareness about them to a wide audience of project practitioners and decision-makers. Doing so may expedite their application on projects and thus gradually and significantly improve the overall quality of the management and engagement of their stakeholders.

In this paper the authors present and outline ten selected ‘best practices’ for managing and engaging stakeholders on projects. The insights gained are an outcome of the authors’ long-term inter-institutional collaborative research program on the management and engagement of stakeholders on projects, which is currently running in its sixth year. Some of these best practices came to light in discussions and interviews conducted by them over the time period 2017-19 with over fifty senior project managers and stakeholders

excercising managerial functions on projects in the United States of America and Pakistan. Others stem from the authors' own personal reflection and experiences with large and complex projects accumulated over a period of several decades.

Although the best practices outlined in this paper can be applied in the context of any category of projects which are being undertaken anywhere they are especially useful for managing and engaging stakeholders on large and complex projects as are typically encountered in major construction and civil infrastructure development schemes. Such projects normally have a large number of primary stakeholders – i.e. those stakeholders which are actively participating in the project and have contractually assigned roles and responsibilities in it – some of whom are individuals serving in an independent capacity while others are organizations. All these entities work collaboratively by combining their inputs, resources and expertise for the purpose of undertaking the project. As knowledge, appreciation and the applied standards of stakeholder management and engagement may differ from stakeholder to stakeholder it is certainly in the interests of the project to not only ensure that all its primary stakeholders are fully cognizant of the criticality of effective stakeholder management and engagement continuously throughout the project life-cycle but also to proactively implement a set of practical measures which can enhance the quality of stakeholder interaction especially with a view towards optimizing collaboration and enhancing performance as well as to keep conflicts and issues between stakeholders to a minimum over the project life-cycle.

The ten 'best practices' are introduced and briefly outlined below. Their order of appearance here is arbitrary and is not intended to signify their level of relative importance. Some of the practices are quicker, easier and less costly to implement than others. However, they all complement each other nicely. Their focus is more on the project's primary stakeholders, less on its secondary stakeholders. Unlike the primary stakeholders, the secondary stakeholders are not active participants in the project and have no assigned roles and responsibilities in it but usually are very large in number, are affected by it in varying degrees and quite often do not always view the project favorably. While each of these practices if applied individually can benefit the project to some degree, it would certainly be no exaggeration to state that their collective, wholehearted and sustained application throughout the project life-cycle over time may bring about a very significant and observable positive impact on both project effectiveness and efficiency and satisfy the interests of both the project as well as (and in particular) its (primary) stakeholders.

Measure 01: Project Stakeholder Management Standard

Project management is a powerful and still evolving subject discipline. Over a period of many years and even several decades, the systematic study by academics, researchers,

project management associations, consultants, and numerous others, of countless projects undertaken in diverse categories across the globe have generated a deep pool of knowledge and understanding of how projects can and should be professionally managed. With every passing year new insights, concepts and ideas are surfacing which are contributing towards improvement of, inter alia, the processes, tools and techniques, and the standards needed to undertake projects more efficiently and effectively and to help them better manage the negative risks facing them in an increasingly complex, competitive, and multicultural globalized environment.

Standards in particular have advanced immensely in the recent years. Most organizations appear to apply 'off-the-shelf' standards on their projects. Examples are the Project Management Institute's PMBOK, the Association of Project Management's APMBOK, and the International Project Management Association's ICB – to name a few of the more popular ones which are highly regarded and widely applied by project practitioners across the globe and whose contents are revised and updated periodically. Some project management standards have been developed by country-level associations. Furthermore, many public and commercial organizations have invested considerable time, effort and resources in developing their own project management standards specifically suited to their own needs, requirements and operational environment.

Stakeholders are central to every project. Basically, they lie right at the very core a project. Every aspect of a project extending from its conception to its initiation throughout to its completion and thereafter directly involves stakeholders. Numerous project performance surveys conducted across the globe in various project categories over many years have clearly indicated that stakeholder-related considerations tend to play a significantly more crucial role in project success or failure than technical or other factors. Failure to manage and engage stakeholders is obviously asking for trouble. Hence, given the criticality of effective stakeholder management and engagement on projects, especially on large and complex schemes which in this regard traditionally are highly challenging, the authors and some of their interview partners are of the view that an industry-, organization- or even project-specific standard developed specifically with an exclusive focus on project stakeholders, both primary and secondary, and vigorously implemented, can help ensure the highest possible level of efficacy in managing these entities over the project life-cycle and help bring about a win-win situation for both the projects and their stakeholders. With this idea in mind, the authors had already earlier proposed the creation of a *Project Stakeholder Governance Framework* which they introduced at the University of Maryland's first annual project management symposium held in June 2014. Highlights of this governance framework were four integrated components, namely, institutional, instrumental, informational, and research & education. In the view of the authors these four components collectively constitute the foundation for the creation, application, consolidation and gradual improvement over time of the organization's entire gamut of principles, guidelines,

policies, decision-making structures, rules, procedures, processes, tools and techniques, systems, databases and infrastructure, training, research and so forth, which determine the relationship between the organization's projects and all its stakeholders. Holistic in outlook and practical albeit somewhat complex and potentially costly to implement, an inclusive framework with this high level of sophistication can be developed by or for any organization and can be especially beneficial for those organizations which maintain sizeable project portfolios or whose operations are largely project-driven. An unwavering interest and commitment by senior management along with willingness to expend organizational resources and take risks and develop a conducive organizational culture are, off course, essential prerequisites for overcoming the challenges and bringing such frameworks into existence and ensuring that they function successfully and adapt to changing situations over time. On the other hand, attempts that are poorly conceived, planned or executed may cause serious problems for organizations instead of delivering the desired solutions.

Interestingly, and in apparent recognition of the crucial role and importance of stakeholders on projects, considerable effort has been made in recent years by some commercial organizations and government agencies and ministries to develop and implement standards applicable for dealing with their stakeholders as the currently impressive and expanding array of publicly accessible and sophisticated stakeholder engagement toolkits (for instance, in water resource management, forestry, urban revitalization, mining and other major project fields), guidelines, policies etc. aptly reveals. Clearly, there is immense scope for expansion into all project fields.

Measure 02: The Project Stakeholder Charter

On large and complex projects all (primary) stakeholders are active and direct participants with assigned roles and responsibilities. Besides the project manager and team, the project board or steering committee, and the project client, these typically include numerous independent entities ranging from individuals to large organizations. Entities usually involved in such projects are, for example, consultants, designers, advisers, financers, contractors and sub-contractors, vendors, and government agencies. Usually serving as voluntary participants in a project, all have their own respective interests, objectives, motivation, concerns, expectations and perceptions in relation to the project. Quite often such do not completely concide. For instance, whereas the expected financial benefit its participation in the project may far outweigh all other considerations for one stakeholder, another stakeholder which may view the project primarily as a means of improving its public visibility and standing and seeking to develop professional networking opportunities with other participating entities. Consequently, it would be an error of judgement for the project to look at all its primary stakeholders under the same lens and

may be potentially damaging for it to automatically assume that because of their contractual bond to the project they will wholeheartedly and unwaveringly support it under any and all circumstances for the entire duration of their participation in the project. Should a stakeholder for some reason come to view the project less favourably any time after formally joining it, then a demotivation effect may set in resulting in a decline in its interest and performance. This in turn may adversely impact not only its own project activities and tasks but those of other stakeholders which depend on them as well. The onus therefore lies with the project to carefully analyze the attributes of its primary stakeholders from the onset of their joining the project and through periodic monitoring and assesment ensure that stakeholders stay content and in case of any issues or conflicts arise to analyze their causes and implement prompt remedial action.

Keeping the above in mind, and based on their interviews with project practitioners, the authors came up with the idea for a Stakeholder Partnership Charter. This is a written document which would become part of the project documentation system and which is endorsed, signed and (hopefully) adhered to by all the primary stakeholders. The Charter is developed in careful consultation with each stakeholder and comprehensively lists and clarifies, inter alia, their respective specific roles and responsibilities, interests, objectives and expectations in relation to the project. It is a valuable reference which the project can update and use over its life-cycle to systematically ensure fulfillment of its primary stakeholders' declared needs and wants and to prevent or promptly address and rectify any observed negative deviations which may crop up over time. At the same time, the Charter helps promote mutual understanding of the differences which exist among stakeholders and helps sustain their commitment to and full cooperation for the project.

Stakeholder-specific charters of sorts are already being utilized on many projects. Usually their scope and content is restricted. A case in point is the project team charter which documents the roles and responsibilities and the work targets of the project team members.

Measure 03: Stakeholder Collaboration Clause in Project Contracts

According to renowned US project management scholars Cleland & Ireland primary stakeholders encompass all those entities which have a contractual bond with the project or some legal obligation towards it. On large and complex projects numerous entities, including those specifically mentioned in the previous section, fall in this primary category which is distinct from the category of the secondary stakeholders, all of whom have no contractual bond or legal obligation to the project and consequently lie outside its formal control.

As with all contracts, project contracts too are legally binding and enforceable and spell out the roles and responsibilities of the contracting (primary) stakeholders. Contracts can also be instrumentalized for requiring the maximum attainable level of collaboration both between the project and all its stakeholders as well as between the various primary stakeholders actively participating in the project. For instance, to ensure maximum stakeholder collaboration on projects – and thereby increase project efficiency and likelihood of the project being a success - a suggestion surfaced in the course of the interviews conducted for this study to mandatorily include an at all times maximum and prompt collaboration assurance clause in every project contract. Compliance of this obligation by all primary stakeholders would be carefully and individually monitored by the project over time and linked with the application of a points-based collaboration assessment system administered by an evaluation committee specifically tasked for this purpose. Each observed shortcoming in the level of collaboration by a stakeholder would be assigned a score; severe cases would be assigned comparatively higher scores than less serious ones. Periodically reviewing the aggregate scores attained by each stakeholder and carefully analyzing the underlying reasons would serve as a useful basis for discussions between the project and its stakeholders for preventing future or resolving current collaboration issues and problems. If the aggregate score exceeds a pre-specified tolerance limit and an improvement in the quality of collaboration between the project and stakeholder(s) concerned is not feasible or foreseeable despite repeated attempts, termination of the contract between the project and the stakeholder(s) concerned may be considered.

Measure 04: Performance Incentives & Rewards

Project stakeholders, regardless of whether they are individuals, groups or organizations, normally tend to perform better when offered appropriate incentives and rewards for rendering high-quality, outstanding or innovative work. Best work performance may significantly enhance project efficiency and reduce negative risk to the project, both of which are important project objectives. As stakeholder needs, wants and preferences may presumably cover a broad spectrum, it is important that any system of incentives and rewards used by projects must reflect such differences between stakeholders in order for it to be effective over the project life-cycle and produce the desired beneficial result. Stakeholder motivating factors can be ascertained specifically by surveying or interviewing them all very early on in the project or whenever they join it during the project life-cycle and incorporating their inputs into designing a customized reward and incentive system. The proposed rewards and incentives identified in the course of the interviews conducted for this research tend to fall into three broad categories:

- Monetary incentives & rewards intended for especially high-performing stakeholders, such as project team members and which could include, for example, payment of a bonus or special grant or allowance.
- Incentives & rewards encompassing better promotional opportunities, more free time, official acknowledgement and commendations, improved access to facilities and a better working environment.
- Preferential access or guaranteed participation on future major projects. This can be of special interest to independent stakeholders such as consultants, contractors or vendors.

Measure 05: Training for Project Stakeholders About Stakeholders

Training is an important tool for imparting knowledge and improving work performance. Many projects make extensive use of training conducted by in-house or external subject matter experts covering a variety of themes (often development of technical or soft skills) for its employees. However, it appears that trainings specifically focused on stakeholder management and engagement are still relatively few and far in between. Considering that stakeholders are central to every project – perhaps even more so in fact than the parameters comprising the 'iron triangle' – and that project performance surveys undertaken across the globe over several years consistently indicate that stakeholder-related issues and challenges constitute an overall significantly bigger threat to project success than factors unrelated to stakeholders, it is surprising that relatively few organizations and projects attempt to systematically educate and inform their employees about the myriad complexities involved in project stakeholder management and engagement and how best to effectively and efficiently handle such complexities and interact with stakeholders professionally and responsibly.

In discussions with project practitioners, an idea surfaced for projects to impart mandatory training to spread knowledge, awareness and understanding of the criticality of good stakeholder management and engagement. Participation in the training would thereby not only be confined to project employees but would be a requirement for all key primary stakeholders having managerial or decision-making roles and responsibilities on large and complex projects involving multiple independent professionals and organizations. Broad participation in such training has the advantage that all participating stakeholders would acquire an equal understanding of all salient concepts, rules, policies, standards, guidelines, processes, tools and techniques, procedures, best practices etc. relating to stakeholders which are applicable on the project. Conducted by experienced experts over a period of minimum two to a maximum of five days, the consensus among interviewees was that such trainings must be held as early as possible in the project life-cycle,

preferably shortly after project initiation, and repeated at any point in time in the project life-cycle if deemed necessary.

Measure 06: Project Stakeholder Audit

Audits constitute an objective, effective and time-tested tool for evaluating on-going and completed projects. Though usually quite complex, time-consuming and expensive to undertake they can often yield valuable insights. Audits are versatile tools and can focus on specific themes such as financing, quality and technical performance. A variation of the audit, as proposed by the interviewees of this study, can also be used to comprehensively analyze and assess effectiveness and efficiency of the management and engagement of the stakeholders. This would be especially useful for large, complex or mission-critical projects. A stakeholder audit can reveal, inter alia, whether or not the prescribed stakeholder management and engagement standards, policies, processes, procedures, tools & techniques etc. were adhered to by the project. It can also deliver valuable insight into how well or otherwise stakeholder conflicts, issues and problems were handled in addition to collecting, reviewing and assessing detailed critical feedback from stakeholders and offering practical suggestions for improving the quality of stakeholder management and engagement on future projects.

Measure 07: Project Stakeholder Handbook

Project stakeholder management/engagement is a complex and challenging undertaking based on a now quite highly developed and extensive field of knowledge which makes the process of finding creative, fair and flexible solutions, especially of the win-win type, for both projects and their stakeholders easier. Knowledge has be to be shared in order for it to be applied. Training is one way of achieving this; another way is in the form of a manual or handbook accessible to all primary stakeholders. Many commercial organizations and government agencies have developed their own project management handbooks or manuals for reference while planning, designing, executing and controlling their projects. A project- or organization-specific stakeholder manual or handbook developed specially for use by and for the purpose of guiding all primary stakeholders would constitute an invaluable and focused source of information about managing and engaging stakeholders as effectively and efficiently as possible. This document can be periodically updated over time as new knowledge, insights and experiences are gained.

Contents of the stakeholder handbook would include both descriptive and prescriptive material. The former typically encompasses, inter alia, the principles, policies, guidelines, standards, rules, procedures, processes, tools and techniques, work flow diagrams, forms, templates, checklists etc. which apply to and are to be used for managing and

engaging stakeholders. Included among the latter and based on past experience are, for instance, practical advice, guidance and suggestions for preventing and dealing with complex and tricky situations, challenges, conflicts, issues, problems etc. with stakeholders, best practices and strategies for attaining win-win solutions, ethical conduct and case studies highlighting both excellent and worst stakeholder management and engagement.

Measure 08: Project Stakeholder Newsletter

A useful, variable and up-to-date source of information for primary stakeholders over the course of the project-cycle is the project stakeholder newsletter. Published and circulated to all primary stakeholders by the project office periodically, the purpose of such newsletter is basically to keep stakeholders informed about the project progress and its achieved milestones to date as well as upcoming work, and to highlight their contribution towards achievement of the project goal through their respective activities, tasks, and mutual collaboration. A feature of the newsletter can be to throw light on stakeholder concerns, issues, conflicts, problems etc. currently occurring and provide an opportunity for primary stakeholders to share their knowledge, ideas and experiences, and propose practical suggestions with a view to improving the quality of stakeholder interaction and their management and engagement on the project.

Measure 09: Project Stakeholder Surveys & Interviews

Access to quality information is a critical input for effective stakeholder management and engagement. Only when the project is fully aware of its stakeholders' respective needs, wants, concerns etc. is it possible to address these systematically and properly in a timely manner over the project life-cycle.

Surveying is an excellent, versatile and established tool for acquiring information from a project's stakeholders, both primary and secondary. Generally straightforward, quick and cheap to conduct, well-designed and effective surveys can deliver deep insights about stakeholders. A major advantage of surveying is that the process can be repeated over time and comparisons drawn with data collected from previously undertaken surveys. Such comparisons are very useful for revealing trends and significant differences, the underlying reasons for which can then be ascertained through careful analysis and research. In project context three integrated forms of surveys are especially useful for gathering information from stakeholders, namely, expectation, perception, and satisfaction surveys. Expectation surveys determine the stakeholders' views of situations or conditions on the project that they believe will or may occur, or may not occur, at future

points in time over the project life-cycle and thereafter. Perception surveys deliver insight from stakeholder perspective about the level of fulfillment - fully, partially, or not - of their pre-identified expectations. Divergence between stakeholder expectations and perceptions may be problematic for the project and must be skillfully addressed by it. Satisfaction surveys provide insight into the stakeholders' mood towards the project. Continuously declining satisfaction levels over time obviously do not augur well for the project and are an indicator that changes in the approach used for managing and engaging stakeholders may be needed.

Surveys can be supplemented with in-depth interviews of stakeholders with a view to soliciting their inputs especially with regard to improving the quality of their interaction, especially in critical areas such as stakeholder communication, cooperation and work coordination. Focus groups are a particularly useful tool in this regard. Formed at the beginning of a project and existing until it ends, focus groups could yield very valuable insights and suggestions which if acted upon may prove highly beneficial for the project and for future projects. Consideration in this regard may also be given to forming a group of specialized focus groups each comprising stakeholders having similar or closely-related roles and responsibilities, tasks etc. or who are closely interacting with each other over time.

Measure 10: Mobile Monitoring, Evaluation & Facilitation Team

The Mobile Monitoring, Evaluation & Facilitation Team is an institutional mechanism intended to provide the project over the course of its life-cycle with the ability to reach out directly to its stakeholders, both primary and secondary, by visiting them on-site and ascertaining if they have any concerns, problems or issues, guidance or advice, or other important matters regarding the project which these stakeholders believe need to be raised and examined. A major advantage of having this team is that it can quickly access potentially valuable inputs from stakeholders which they may not have been inclined to disclose had the project not approached them directly. In particular, it also provides the project with an opportunity to quickly and effectively monitor and assess any problems encountered by stakeholders resulting from the project activities and where and when possible resolving these problems by taking on-the-spot remedial decisions.

Membership of the team can comprise key primary stakeholders or their representatives along with equal representation by a group of neutral independent entities of high social standing and impeccable reputation – such as for example, community leaders, subject matter experts and officials of well-established non-governmental organizations - the purpose of the latter group's presence being to reassure and instill confidence in stakeholders, especially secondary ones, that the project views the interests of all its stakeholders very seriously and seeks to pursue a fair, ethical and balanced approach in its dealings

with them. The team could report directly to the project board or steering committee with its responsibilities and authority contained in its Terms of Reference document.

CONCLUSION

As shown in this paper, and based on analysis of the feedback acquired from a series of in-depth interviews, projects can benefit immensely by applying a set of simple, practical, integrated and fairly easy to implement stakeholder management and engagement 'best practices' over the duration of their life-cycles. The overall benefits to both projects and their stakeholders from these practices will presumably be significantly higher than their cost and the effort, complexity and practical challenges involved in designing and executing them. This is an interesting subject field whose further exploration and consideration clearly offers many possibilities for creativity on the part of project planners and owners and for the pursuit of win-win solutions for all stakeholders.

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UMD Project Management Symposium

BIM IMPLEMENTATION PRACTICES OF CONSTRUCTION ORGANISATIONS IN THE UK AEC INDUSTRY

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ABSTRACT

The aim of this research was to investigate the implementation practices and application of BIM technology by construction organisations through the project phases from inception to operational use in the United Kingdom. The aim and objectives of the study were achieved using qualitative methodology. Semi-structured interview was used for collecting data. Secondary source of data collection included a comprehensive literature review on past and current work on BIM implementation and application across the project lifecycle. To achieve the overall aim fully, a generic Process Map was deemed best to illustrate the BIM implementation practices of construction organisations through the project phases in the UK. The BIM functions or sub-processes at each project phases of the construction process were highlighted from the interviews. Then the generic process map above linking all the BIM activities in the project was developed. The information outputs at the end of each project stage were illustrated in the Process Map. The information inputs feeding into the BIM functions at the project phases were also examined from the interviews and illustrated in the process map. The information inputs feeding into the BIM functions at the project phases were also examined from the interviews and illustrated in the Process Map.

Keywords*: Building Information Modelling (BIM), BIM Implementation Practices, BIM Implementation Process Map, UK AEC Industry, 2013 RIBA Plan of Work*

1. INTRODUCTION

Research has shown that the construction industry is a complex and dynamic one; hence, making construction projects one of the most complex endeavours there is. The complexity of projects in the industry is increasing rapidly and is seen as a major failure factor in construction in construction project management. This is due to the construction industry being regarded as a "loosely-coupled system" or fragmented industry. Research has also shown that the industry has been slow in adopting management techniques and technological innovations that have enhanced productivity and performance in other industries. These new electronic commerce applications or Business Process Re-engineering (BPR) models such as CALIBER (used for measuring onsite performance), Value Management, Benchmarking, Lean Thinking, Just-In-Time, Concurrent Engineering, Cost Reduction Initiative for the New Era (CRINE), Standardised Process Improvement for Construction Enterprises (SPICE), Total Quality Management, Strategic Project Management, Planning applications tools (such as Microsoft Project, Primavera, RIBA Plan of Work, British Property Federation Manual, Generic Design and Construction Process Protocol, Building Information Modelling (BIM), etc., produce 'strategic, operational, and opportunity benefits to its users in the construction supply chain', as it can overcome most of the current challenges that reduces the capacity for effective management of the construction processes. According to Akintoye, Goulding and Zawdie (2012), construction practitioners advocate that the Building Information Modelling (BIM) can be used to ease the complexity of the partnering or collaborative process in the delivery of a project. This can be achieved by adopting the BIM technology or business process application as a collaborative platform to "bridge the information loss associated with handling a project from the design team, to the construction team, and the building owner", such that each group contributes and refers back to information developed during the lifecycle of a project.

2. LITERATURE REVIEW

The RIBA Plan of Work appears to be the most widely used Plan of Work in the UK, although, the UK Government's PAS 1192 and the CIC's Digital Plan of Work are also very much in use in the AEC industry. The RIBA Outline Plan of Work published in 2007 is only applicable to the DBB procurement route.

2.1 The 2013 RIBA Plan of Work

The new RIBA Outline Plan of Work, published in 2013 incorporates the principles of sustainability, provides the platform to support and facilitate the BIM processes and technology; enhances effective collaboration amongst project participants; provides a template for the adoption of all forms of procurement routes (DBB, DB, CM@R, IPD, etc.); and gives room for adjustments in the timing and application of municipal planning procedures (RIBA, 2013).

According to Sinclair and Eynon (2013), the RIBA Plan of Work is the most widely used Plan of Work or Construction Process Model in the UK. The UK Government Construction Strategy document published in 2011 was an impetus for the evolution of the RIBA Plan of Work. This evolution was made possible by the joint action of RIBA and the CIC's BIM task group, which gave rise to unified project stages synonymous with the PAS 1192 and the CIC's digital Plan of Work.

One of the sweeping changes the RIBA Plan of Work 2013 brought is the paradigm shift from design team functions to project team functions that incorporates the Client, the construction team and the design team (Sinclair and Eynon, 2013). In line with the UK Government Strategy, the RIBA Plan of Work supports the exchange of information at the end of each stage, noting that the deliverable at the project stages will be 3D models for the purpose of town planning application, Client approval, or for a Contractor to begin construction work.

The new RIBA Plan of Work sets out to constitute a collaborative project team by deciding from the outset stakeholders' responsibilities during the project lifecycle. The Project Manager endeavours to make sure that the right information is conveyed to the right participant at the

right time, involving all stakeholders and ensuring that the project objectives of time, cost, quality, and sustainability are achieved (Sinclair and Eynon, 2013).

The overall process flow of the RIBA Plan of Work, like the CIC Digital Plan of Work, and the PAS 1192 – Part 2 Plan of Work is: PREPARE→ DESIGN → CONSTRUCT→ USE, which is broken down into 8 project stages (RIBA, 2013).

Stage 0 – the Strategic Definition stage, involves identifying the Client's business case and strategic brief, together with other project requirements.

Stage 1 – the Preparation and Brief stage, involves developing Project Objectives, Project Outcomes, Project Budget, Feasibility Studies and review Site Information.

Stage 2 – the Concept Design stage, involves Outline Proposals, Outline Specifications, Preliminary Cost Information; the Final Project Brief is issued at this stage.

Stage 3 – the Developed Design stage, involves preparing the Developed Design with completed proposals for the structural design, building services, Cost Information and Project Strategies.

Stage 4 – the Technical Design stage, involves preparing the Technical Design in line with Design Responsibility Matrix and Project Strategies to incorporate all architectural, structural, building services information, Subcontractor design and specifications.

Stage 5 – the Construction stage, entails offsite production and onsite construction in tandem with the Programme of Works and resolution of queries as they crop up on site.

Stage 6 – the Handover and Close Out stage, entails the handover of the project facility, and termination of the building contract. This closeout involves defect inspection as they are refurbished.

2.2 Building Information Modelling (BIM)

Miettinen and Paavola (2014) noted that there is no singly satisfactory definition of what BIM is; instead there is a need to analyse it as a "multi-dimensional, historically evolving, complex phenomenon." Miettinen and Paavola affirmed that the various definitions in the literature contain and replicate the following elements:

- All relevant information regarding the design and construction of a facility are included in a single model or is accessible with BIM tools, via common database system.
- The interoperability of data-sharing (enabled with open standards like Industry Foundation Classes - IFC) between several BIM design tools facilities better integrated ways of collaborating on a project.

BIM is usually utilised and maintained throughout the life span of a project from inception through construction to deconstruction/decommissioning.

- BIM increases appreciably the effectiveness, efficiency and overall productivity of the AEC industry.

Miettinen and Paavola (2014) defined BIM as "a digital representation of a building, an object-oriented three-dimensional model, or a repository of project information to facilitate interoperability and exchange of information with related software applications." BIM is not just a software tool, but a technology and a process, which is embedded into a Plan of Work, chosen by the Client, to meet project requirements throughout the preparation, design, construction, and operational phases of a facility.

3. METHODOLOGY

3.1 Interview and Case Study methods

Interview method was adopted for this research for the following reasons: In-depth information was easily obtainable; there was greater flexibility than the questionnaire method to rephrase questions for better clarity and information; non-response of interviewees was much lower, hence cases were controlled more easily; the interviewer had access to additional information

about the interviewee's personal information and work environment that may greatly enrich the interpretation of results (Kothari, 2004).

A case study design was adopted for this study because the focus of the research is to answer the "how" and "why" questions, and to cover contextual conditions relevant to the phenomenon in question (Yin, 2009). A multiple-case study (2 or more cases) was adopted for this research to enable the researcher to explore differences between and within cases. For this research work, a literal replication of 2 cases was required to achieve similar research outcomes (based on literature review) and to achieve a greater degree of certainty and validation of the research study.

The target population for this research work are companies involved in architecture, engineering, project management, and construction, and who have had involvements in BIM project environments. The choice of respondents in these organisations was made in gathering relevant data because these BIM Experts were directly involved in the supply chain for the delivery of BIM-driven projects across the UK. The respondents were drawn from Construction Organisations in the North West and Central London regions of England.

Since, it is practically impossible to collect data from all construction organisations or all professionals; the non-probabilistic sampling technique was used, also known as deliberate or purposive sampling. Hence, a sampling size of 2 Case Studies was purposively selected in the North West and Central London regions of England, which were later used to represent the research findings for the United Kingdom.

4. RESULTS AND DISCUSSION

To achieve the overall objective, a generic Process Map would best describe the BIM implementation practices of construction organisations through the project phases in the UK. Hence, the Process Map incorporating the case studies was developed and illustrated below:

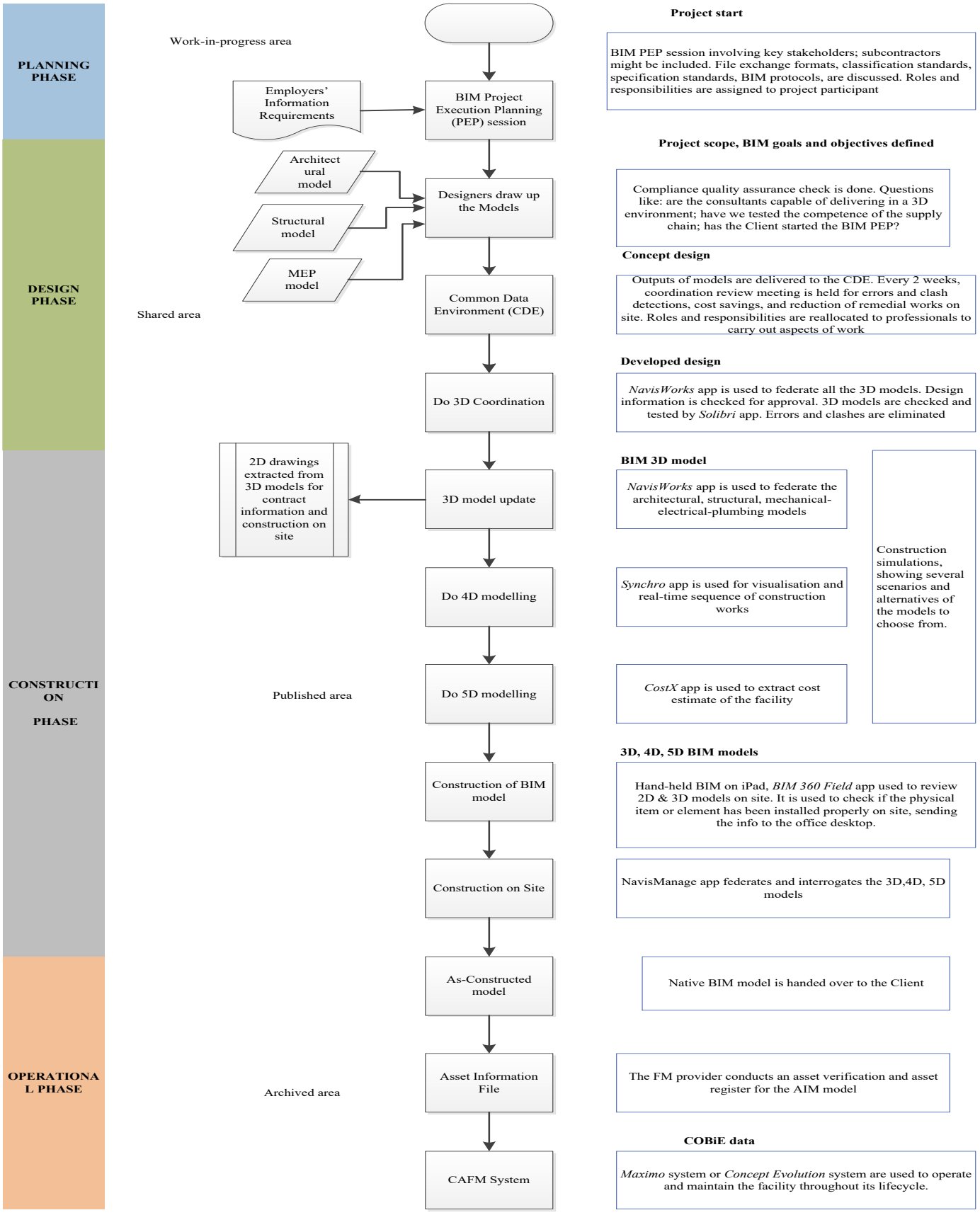

Fig. 1. Process Map Showing BIM Implementation through the Project Phases. *Source Author*

5. CONCLUSION

The BIM functions or sub-processes at each project phases of the construction process were highlighted from the interviews. Then the generic process map above linking all the BIM activities in the project was developed. The information outputs at the end of each project stage were illustrated in the process map. The information inputs feeding into the BIM functions at the project phases were also examined from the interviews and illustrated in the process map. The information inputs feeding into the BIM functions at the project phases were also examined from the interviews and illustrated in the process map. The Process Map formalises the BIM implementation practice in construction organisations so that people can work more collaboratively, thereby improving the process of planning and implementing BIM across the project lifecycle.

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UMD Project Management Symposium

Changing the World One Person at a Time

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ABSTRACT

After a year's research across the width and breadth of the United Kingdom, a report was issued by Mark Reeson to the Secretary of State for Housing to identify the ongoing problem for homelessness in the cities of the UK. On the back of this research across all four countries, a solution was developed to be implemented into the Mayoral cities so that local authorities had the opportunity to improve the lives of thousands of individuals currently in temporary accommodation or living rough.

The presentation looks at the areas and methods of research and the interactions with the various bodies of stakeholders, both affected and affecting the current state of affairs and how the solution was developed by looking at the people that can and do make a difference for a better future for so many worse off than others.
Mark will take you on the whole journey, from initiating the idea, through to the roll out of the plan, its acceptance into government and then the extended impact it had as the report reached all points of the globe as further requests for support and assistance came in.

The delegates will be engaged from the first minute to the last on how the change process was applied to stimulate the change, how the various bodies chose their own forms of communication and how they shared the news internally and externally with their own community stakeholders to ensure they made a real difference.

OVERVIEW TO HOMELESSNESS

According to the United Nations Department of Economic and Social Affairs (UN DESA) a homeless household is defined as those households without a shelter that would fall within the scope of living quarters.

Further to this, in a survey taken in December 2016 by the UK charity Shelter, there was an estimated 250,000 people living in the conditions that were defined by UN DESA. The most severe of those calculated in the survey are registered as homeless (roofless), this category includes those people living in the streets without a shelter that would fall within the scope of acceptable living quarters.

The key to understanding the problem is the initial acceptance that it is created through a complex myriad of issues that cannot be simply addressed by changing one thing, but instead is a behavioural change throughout society into how homelessness is perceived by many and the fundamentals causes behind it. Homelessness, however, does have some major reasons or causes that must be addressed if this endemic plight within the UK is to be addressed correctly.

The major reasons identified through numerous surveys and reports are:

- Domestic violence
- Forced evictions
- Foreclosures on landlords leading to eviction of their tenants
- Gentrification, the process where a neighborhood becomes popular with wealthier people pricing out the poorer residents
- Lack of accessible healthcare
- Lack of affordable housing
- Living with a disability, especially where disability services are non-existent or poorly performing
- Living with a mental disorder, where mental health services are unavailable or difficult to access
- Migration, either domestic or foreign to the country, where the number of migrants outstrips the supply of affordable housing
- Mortgage foreclosures where mortgage holders see the best solution to a loan default is to take and sell the house to pay off the debt
- Poverty, caused by factors including unemployment and underemployment
- Prison release and re-entry into society
- Relationship breakdown, particularly in relation to young people and their parents
- Short-term contracts in the workplace with low salaries for young people, often leading to an instability of mental and financial wellbeing, which results in problems in getting an apartment or paying rents on a regular basis
- Social exclusion because of sexual orientation (LGBT etc.) and gender identity
- Substance abuse or addiction, such as alcoholism or drug addiction

Currently, the UK provides a variety of services to assist homeless people. They often provide food, shelter and clothing and are run by community organisations, charities, churches or government departments. Whilst some homeless people are known to have developed a community within themselves, offering various types of support, this does not solve the problem and can in actual fact exasperate the problem by creating a fictious lifestyle that dramatically differs from the reality of ‘street-life’.

In addition, the country lacks any idea or respective approach of how to support these people creating an environment where they learn to help themselves, but without any stability to aid recovery or to build a self-determined quality of life again.

INTRODUCTION TO THE SOLUTION MODEL

The solution to this problem is by bringing together the community in a way that supports its own environment and where it has a say both strategically and tactically in its own future. This solution is in no way a replacement for the charities and the support communities that exist currently, but what this offers is a greater structure for the community to grow once more and for the people to be directly involved and becoming responsible in the shaping of their city, town or village so that it meets the ethos of the Smart Community Model, which believes in a community FOR ALL.

It has been through the study of behaviours and by listening to the City, District and County Councils that I believe the Smart Community Model can help secure a future for the towns and cities of the UK. With a secure community, the addition of the COSI approach, (which will be described in greater detail later within this paper) the management of the homelessness problem can be addressed and then remedied over the coming years.

The Smart Community Model was developed by Professor Mark Reeson in 2017 whilst he was working in the Kingdom of Saudi Arabia creating a new approach to project management for the Eastern Province Municipality. Within the main body of the document, this model will be described within greater detail but as an overview, the original Smart Model was designed to help with improved structure and efficiency and then the community model was added to give greater meaning within the change programme for the region. This urban planning was then enhanced through a process called Smart Vision, which when added to the remaining parts of the Smart Model to create a fully rounded tool. Once the model was decided to become part of the homelessness solution, a further element, called the COSI situational management approach was added to give greater direction through a four-step methodology to change the lives of the homeless and those impacted by it. During the research stage of this paper,

I was approached by several people all offering advice and support to how the problem could be resolved and each of these are blended into the Smart Model already adding greater value and gravitas. The Smart Model itself has been tested in Frankfurt, Germany and in Dammam, Saudi Arabia for the purposes of business and project management with strong, positive feedback from both regions. In an ever-changing environment the UK finds itself with regards to homelessness, the Smart Community Model supported by the COSI situational management approach offers help, support and a realistic solution for the future for Great Britain and Northern Ireland FOR ALL.

SOLUTION DEVELOPMENT

Prior to developing the solution, the key problem that I had was to understand the real issues faced by the authorities within their towns and cities. To address this, I requested assistance to as many organisations to gain as much information across as wide a cross section of the UK as possible. The feedback and therefore the solution, is based around the Strategic Management Plans that were returned to me from those authorities that responded.

In total, there were fifty responses and the breakdown of these across the UK was as follows:

- England 25
- Scotland 12
- Wales 7
- Northern Ireland 6

After reviewing the authority strategic plans, there is a common theme around the lack of affordable housing options for many larger households. The larger the city, the greater the issue becomes with many councils only able to offer a limited number of four plus bedroom houses. This, even when possible, is then exacerbated by the cap on housing benefits.

There also seems to be an increase in difficulties experienced by people aged under 35 in securing affordable accommodation, particularly if they are in a low-income job or unemployed. Whilst there remains a relatively good supply of accommodation of this type, it is often not affordable for this social group. People who are subject to benefit restrictions face additional difficulties.

This situation then creates a different problem as this leads to younger people within this social group having to live with family or friends for longer which creates an endless growing housing need in the city, as well as an affordable housing offer for young people and young workers.

The UK has a growing population, which is consistently placing an increasing pressure on its existing housing stock. In some areas of the UK, there are more than three times the rate of priority homeless households than the national average and double the rate of core city neighbours. These continuously growing rates can also be a direct consequence of the current ‘broken’ housing system.

Currently, the statutory homeless system seems to offer a methodology to offer permanent accommodation, however this contrasts dramatically with the difficulties that people experience in finding suitable and affordable accommodation. Increasingly, people are presenting as statutory homeless because an assured short hold tenancy has ended and then there is no further accommodation for the social groups to enter.

A further major contributor to homelessness is domestic abuse and parental exclusion. One aspect of domestic abuse is that this can lead to homeless applications being

submitted from outside of one city into another to secure the safety of those individuals involved. This can heap greater pressures on to neighbouring towns and cities which are seen an unexpected and therefore need further support with emergency housing and budgeting.

Deprivation and its associated poverty are key barriers for accessing suitable housing and maintaining stable and financially sustainable tenancies. Access to employment is a key mechanism for preventing potential future homelessness. Some of the major cities in the UK have some of the lowest average household incomes.

Once this is combined with a region of relatively high rates of unemployment, this becomes the driver towards housing exclusion. A further source leading towards homelessness is a household's poor financial management and a failure to maximize household income also limit people's ability to access and sustain their housing commitment.

Homelessness is an adverse childhood experience that can have a long-term negative impact on their development.
Some cities have a very high level of families who are homeless and/or in temporary accommodation. This inability to secure a permanent residence for the family but specifically for children affects their ability to carry out social bonding. This leads generally to lower levels of school performance as well as being linked to disadvantage in future generations. In a recent survey in Birmingham, more than three quarters of applicants accepted as homeless and in priority need have children, either with a lone parent, or as dependents of a couple.

The Smart Community Model and the COSI approach to recovery has been made specifically people focused, with an emphasis on securing safe accommodation but within a sustainable environment to prevent future homelessness by addressing the underlying cause of peoples' experience. This method therefore recognizes that the impact that the trauma of homelessness can have on both adult and children's physical and mental health and wellbeing. The Smart Communities Model is based around six key themes and by embodying them into any society, this allows the security for those that live within the area and a long-term sustainable solution to the problems that exist, creating a balanced harmony between external investment and internal drive for improvement.

It is the four central elements of the model that then enables the final two of security and sustainability.

Before the model is fully explained, let's start with a fundamental fact. Anything Smart starts and finishes with its people and so the incessant drive towards automation and high technical solutions is not proving to resolve these fundamental issues that people within a poor community suffer from. The perfect example of this has been seen in India, where it has been driving forward the Smart technology solutions in its passion to make India's major cities all 'Smart Cities'. As this drive progresses, there has been no decline, if anything an increase in the number of people begging and sleeping on the streets or in unacceptable accommodation leading those watching from afar to ask is a 'Smart City' really all that Smart when it can't resolve the most basic physiological needs of every

person?

Once it has been decided a Smart City starts and ends with a Smart Community, it is essential those in charge learn to become Community SMART and to invest in their people.

In a world where technology is all around us and we continue to be challenged to save more time and money through the immediacy of automation, there is a huge danger of forgetting a key factor behind any change, it involves people.

Having worked with many 'Smart Specialists' and invested my time to contrast the approaches being taken through some of the latest Smart Cities, it is becoming more apparent that the 'Internet of Things' which has gradually become the 'Internet of Everything' has the potential to make a Smart City, a faceless city, leading to a faceless community.

A city and its identity are not based on what it simply looks like and what it does, but mostly on its cultural and social values. Therefore, a truly Smart City must start and end, with its own Smart Community. However, before we all start to consider throwing out all technology, it is important to recognise that the community that we have will need to be supported and at certain times, directed by certain technologies.

The key word to all this success is balance, so that the technology that we use adds real value to "The City and its Community" in a way that it is FOR ALL and that it does not create a new version of a class society leaving behind members of our valued and unique society that has been built up of centuries.

So, what exactly is a Smart Community and what does it mean to become Community SMART? Starting quite simply, people are impacted by their living or working environment, whether a city, an organisation, or region. The impact can be evaluated using six key factors, each one as equally important individually, but when combined, creating a powerful sense of well-being and integrated inclusion FOR ALL. The six factors that must be identified and then evaluated in each city or community are as follows:

- Health
- Efficiency
- Livability
- Prosperity
- Safety
- Sustainability

These six factors are generally referenced by organisations or authorized bodies as Social Responsibilities, whether these are personal or corporate. Corporate Social Responsibility (CSR) is that undertaken by a business approach so that it contributes to a sustainable development by delivering economic, social and environmental benefits for all internal and external stakeholders from its plans and its actions. However, CSR is a concept with many definitions and practices all wrapped up inside. One of these key practices, is that of Social Responsibility, which is an idea that businesses, governments or people of

authority should balance the profit-making activities with sociological beneficial activities which involve developing businesses and organisational bodies with a positive relationship to the society in which they operate.

One of the biggest drivers towards CSR and to making a difference to the world and to our communities was the release in January 2016 of the United Nations Development Goals when they issued seventeen Sustainable Development Goals (SDGs) to meet the 2030 Agenda for Sustainable Development. With the plan in place, the intention of the UN is that over the coming fifteen years, these new goals will be applied universally to all, with countries mobilizing efforts to end all forms of poverty, to fight inequality and to also tackle climate change ensuring that no single body of people are left behind. It was whilst reviewing the SDGs in the Autumn of 2017, that it became apparent that the UN strategy is in many ways aligned with the SMART Sustainability Modelling programme which has identified a FOR ALL strategy.

This alignment led the team to then identify how the Smart City approach can also be integrated, so the City SMART initiative that was started by M R Project Solutions Ltd from the UK was implemented in the Kingdom of Saudi Arabia. It is through the correct blending of these models and tools that the major issue of this paper can then be resolved.

The goals of the concept are that each community is unique and so that it calls FOR ALL communities, whether their members are rich, poor or somewhere in between, to promote prosperity whilst also protecting and investing in their own surroundings. With the recognition that ending poverty cannot be achieved without a strategy to build economic growth within their own community this would also lead to further social needs being addressed that are specific to the community at large. Much as the SDGs cannot be made legally binding, the communities and the authorities within them are expected to take ownership of their own areas of responsibility and to then, once a platform of success has been established, create a network to combine regional (local communities and councils) and then national frameworks of values and commitments (national government).

However, without an approach to measure this progress, the idea of the SDGs or a Community SMART programme would be idyllic but essentially toothless, which is why the team created and continue today to develop further the SMART Metrics, which become specific for each and every community that undertakes the programme.

With this concept now firmly established, how does the Community SMART programme begin and how do you start to develop a new approach with a benefit FOR ALL to make a change for the better in the future?

To be able to break down the issue and then address the way the model and the tools can support them, we need to take a closer look at the six factors.

Safety – Creating a Safe Community

A safe community is a “Happy Community”. That sounds simple but is very true.

However, creating an environment where people can flourish needs time and commitment

BY ALL. Firstly, there is a need to identify threats before they can happen and to proactively promote and implement the aversion of danger. One of the best ways for the community to act SMART is through the sharing of information, which requires an open and liberal information flow, without any restrictions and across the different jurisdictions, collating findings with regard to research, development, science and technology, leading to an improvement of the authorities and the communities' situational awareness. With this simple step this can initiate the aim to safeguard lives and to protect the property across the whole community and FOR ALL. The key aspect of having a safe community, is an increased situational awareness.

Communities need to be able to improve the perception of the environmental elements and the events occurring within that environment with respect to the time or the space in which they are in. Being able to ascertain a comprehension of the meaning of this information and then project this status when one or more of the variables change such a time or an event, is key to the safety of the people within the community. Situational awareness is a result of four key elements being brought together and then assessed, simultaneously to draw a picture of perception in the mind of the viewer. These four elements are:

- Situational Understanding – Applying analysis and judgement to the current situation
- Situational Assessment – Achieving, acquiring and/or maintaining your current awareness
- Mental Models – A set of well defined, highly organised yet dynamic knowledge structures developed over time with personal experience
- Sense Making – A motivated and continuous effort to understand the connections between people's behaviours, certain locations or places and any relevant events or occurrences

Looking at the subject of the homelessness and the impact that safety has on the individuals affected, shows how there is a clear differential in social attitudes and behaviour towards homeless people and those more fortunate. The national average of people in the UK that have received any form of intimidating behaviour is 3.6%, compared to 79% when homeless.

The number of attacks on the homeless and crimes against the homeless was addressed in a survey held by Shelter Scotland and Crisis. Within the survey, the findings were as follow:

- 59% had received verbal abuse
- 55% were deliberately kicked, hit or received other forms of physical violence
- 54% had property stolen from them
- 48% received intimidating or direct threatening behaviour
- 34% had items thrown at them on the street
- 23% had their property vandalized
- 9% were urinated on
- 7% were sexually assaulted

Separate from such crimes are the other simple factors such as trying to stay warm, whereby those homeless set fires to keep warm in the cold night increasing the danger of breakout of uncontrolled fires damaging both those involved and the property nearby. Every incident then puts a further strain on the already hard-pressed emergency services.

One final statistic that seems alarming from the survey, was that 53% of crimes reported by the homeless were never followed up by the Police as they felt they did not have the resources available and as the victim had no address, found this hard to progress.

The whole ethos of the Smart Community Model is to protect those that are the weakest in society, not simply because it is the right thing to do, but that safety falls under one of the six elements which is FOR ALL. By looking at the issue at a strategic level to identify the causes and reasons behind the rising numbers of homeless people this would lead to a safer environment FOR ALL.

One of the biggest issues that exists currently within the authorities is a lack of long-term sustainable solution development as this involves both financial and resource investment. There are many times during the year, such as Christmas and the New Year, where charity and those less fortunate get considered but for most of the time, this becomes someone else's problem. For the Smart Community Model to be successful, the community with the authorities must invest time and effort into identifying the problems and then designing the solutions.

The great success of the model up to this point has been that it creates structure, but it does not tell anyone what to do or how to do it. By offering this facility, the city authorities are not constrained by one option or a set of rules but are instead challenged to be as innovative with their solution so that it can demonstrate real value for the time, effort and finances invested. In approaching the solution development with sustainable viewpoint, this avoids the partial fixes which lead to a big push for a limited time but instead leads to long-term self-funded solutions over time.

Efficiency – Planning the Improvements

The aim to efficiency planning for a community is to "Maximize the Efficiency of Events" such as housing development and redevelopment. To achieve this, the parties delivering these events need to define a process of communication between the developments through open and transparent platforms. By informing the community of such developments, allows them to make decisions which can help them to plan how to avoid the congested or under construction areas. In addition, this would allow local utilities to optimise opportunities to inspect any underground assets whilst they are exposed limiting the groundbreaking disruptions to a minimum.

Well run communities have authorities or government departments information hubs which can collect, collate and distribute insightful information to the necessary bodies so that a rapid response to a situation can be carried out or observed. By having this centralised location of data and information generation, it makes it clearer FOR ALL how certain actions could then impact all the community. To assist further with this, if the

information passed meets regulatory constraints or acceptability, this can then be used through public and private partnerships to allow the community to flourish.

Furthermore, this can help organisations within the community to address issues, provide a higher quality service and ensure that the community's essential services remain well run despite the changes or any potential adversity within the region. Efficiency, however, relies on greater connectivity, supporting the argument earlier that "Technology can and does have a key part to play to support the people within your community". As a community then starts to develop and grow, this develops an increased probability on mobility and a greater need by those moving for an accessibility to information.

Herein, lays a major possible risk to your community. With the continued growth of your community through its greater efficiency, comes a greater investment requirement for informational needs and for different modes of delivery to improve both social and economic mobility. After all, as the community grows and looks to create greater revenue and investment for its area, it is imperative that the infrastructure of communication and accommodation meets this demand. Having a successful and affluent community, brings with it environmental, economic and public health challenges but finding the right balance with this against the enhancement of the area to create one rich in innovation and intelligence creates community wide integrated systems and the first signs of becoming Community SMART.

As everyone knows, planning and planning correctly, is the cornerstone to any successful solution. So how can planning really help with the alleviation of homelessness?

The first place to start with this solution, is to review the current number of houses, both public and private, that remain unoccupied. Having identified those properties that are available, the next step would be to create a house sharing scheme with either a minimal rent payment or temporarily no payment so that those affected can be housed correctly. The decision around the amount needed to be paid could be carried out by a means-testing process, or if it is decided that there is no payment for the first few months, that those housed in the accommodation could be given the opportunity to do local work which pays for their housing, giving the occupants the respect of earning their way whilst this approach also means that they are contributing and giving back to their own community.

The additional help that comes from such an approach is that once the individuals have been housed within the house sharing scheme, they would have a permanent address that would allow them to apply for work and to get them back on track so much swifter. As the people occupying the properties would be registered tenants, they would have to uphold certain standards to a signed contract as this would encourage them to keep their homes up to a standard and would discourage antisocial behaviour and drug use, which would be periodically checked by a landlord.

What this cohabitation approach also does, is that if many homeless people live together with a pet, whether it is as most common a dog or cat, meaning that they could keep their pets, removing a currently existing problem whereby many shelters will not take animals which turns the homeless people away from staying as they do not want to be separated.

As the individuals would now be at a fixed address, the local authorities would be able to help with permanent housing solutions and employment opportunities meaning that those that have felt they have been forgotten can feel part of their community once again.

One issue that would have to be handled by the local authorities would be for those individuals leaving home for their own protection, that their anonymity is protected and then when they are housed within a share property, that they may have to be placed in an all-female or all-male accommodation and so this facility and service would have to be available when needed.

Housing the individuals, however, is only half of the solution as once they are under a roof, they still require a purpose. What the Smart Community Model plan offers is the opportunity to create and then introduce a Homeless Rehabilitation Plan. (HRP) What this will allow is for the integration element of the COSI management approach to bring the individuals back into society rather than still feeling isolated on the outskirts of the community, just simply housed and then left alone to fend for themselves.

Once some of the individuals have become success stories for themselves, they can be Programme Champions supporting others already in the programme and making the rehabilitation a self-sustaining systematic process run by those that have lived through the issues. This would remove the pressures off local Government releasing them to other tasks within their roles and simply monitoring and controlling the programme from a distance.

By planning the approach in this manner, this no longer becomes a seasonal or sporadic method to managing the homelessness issue but instead creates a permanent solution that works 365 days a year and 24 hours a day for the benefit of those exposed to these issues, until it is eradicated for good.

In closing this section of the paper, it is important to remember that all good planning is based around a solid governance and involves reviews, not only on the performance of the programme but also the processes and procedures that make the programme work. By introducing periodic checkpoints throughout the programme, this will allow the Smart Model's efficiency to ensure that the delivery is carried out is the most time efficient and cost-effective manner with minimal waste.

Livability – Your Quality of Life Matters

"Communities Thrive when they are proactive".

Having this foresight and positive attitude means that the feeling within is one which is looking to stay ahead of any problems and that when they seek to resolve a problem, they look at long term, sustainable solutions and not the simplest or quickest fixes. With this approach and with a strong view towards longevity, the area thrives through the avoidance or the restrictions that can come through infrastructure fatigue. Changes are made when they are needed to be made and are always made after a thorough evaluation and a clear understanding of the added value this change will bring to the community. For example, if the age of the population in the community rises and the demand for more homes with

assistance is identified, then the changes to the community's priorities need to be addressed. Equally, if the average age of the population starts to move towards the millennials, then a change in entertainment or virtual cloud-based needs may be required.

The attitude is a strong positive one which says yes to change, but only when it is the right change and at the right time for the community. This strength comes from the longevity view that it takes and through its approach to creating the previously mentioned sustainable solutions.

A community's livability is about so much more than the way it looks. Livable communities must wrestle with the multiple priorities placed upon them, to reduce congestion, to safely manage water and waste and to continue to create the right infrastructure for a continuous and sustained success. The community's ability to proactively assess where the relevant infrastructure repairs are necessary and how to balance these against other opportunities to improve the living conditions FOR ALL, where no one is constrained or unfairly treated because of their race, religion, colour or creed is a battle that is fought on a daily basis to create such a harmonious environment.

"The community and the people within it are always viewing long term solutions and not the short-term gains" and this strategy creates a Smart Community which is stable and where everyone associated with it, feels valued.

By having the community support, it helps with the approach to change identifying the best way of problem solving with structure by integrating local experience with external expertise to assist in managing the requirements and the needs of infrastructure for the community at large. This vibrant and transparent environment opens information to more people helping to expose or reveal critical issues and promote livability in a timelier and cost-effective manner.

So, with all this in mind, how would you promote and support the homelessness issue?

Let's start with something very basic so that there is a clearer understand of the term 'Livability'. Livability is the term that determines the quality of life that individuals and communities can expect within their own area, both through their own efforts and the efforts of those in authority. Quality of life investigates the well-being of the community and how they are affected by the ongoing development, or the lack of development within an area. This looks at the impacts around education, recreation, ecology, politics, economics and culture. Developing, designing or creating and maintaining a strong culture within a community should be the focus of everyone.

The secret to having a community having input into their own well-being rather than having it decided for them is that their voice takes on greater meaning. Of course the idealistic approach is to have everything that you wish for in a happy life, but the realization of what is available and what it takes to have that within a community, gives those affected the ability to understand decisions that are made through transparency of decision making.

The type of environment people wishes to live and shop in has changed over the past ten

years and is changing more rapidly than ever before. There is a huge demand on the businesses and authorities to provide instant satisfaction. The public communities' ideas and beliefs have changed and so any solutions that are identified must show creativity and innovation with a sense of recreation built into it. Communities are becoming more inquisitive about how things are done; we now live in a world where online and instant learning has become the norm.

The problem with a simple all tech solutions to community life is that there are many gender and generational issues that have to be addressed to make sure that if an automated solution is designed with the younger generations in mind, that it does not leave the older generations or those less tech savvy behind.

There have been multiple papers and reports written throughout the years, of which one of the most famous was David Morris' sociologist research that stated the way we live and how we live defines a base of literacy which was directly linked to a person's or a community's life expectancy. The Economist Intelligence Unit produced a "Where to be born index" and supported this with a number of Quality of Life reports, however each told you what or where life is better, but none seem to have previously addressed the question of how.

In 2016, a project was initiated by the Eastern Province Saudi Arabian Municipality to improve the way that projects could be delivered more efficiently through a PMO standardised delivery mechanism. The scope of this work soon expanded and with the introduction of the first Smart Model, a challenge was set by the Municipality to address three key aspects for the area:

- Greater accessibility of information to the community
- Improved mobility both in and out of the major cities within the region
- Sustained expansion or reduction in a controlled manner

The approach that was designed by Professor Mark Reeson within the project, was the Smart Model and this was then further supported by the introduction towards the end of the project, of an urban design model called the Smart Vision.

As a general overview of the approach and model, the intention was to introduce a process driven approach that led to a centralised master plan that would then assist with the decision making and the implementation of the work required, with the necessary prioritization towards new housing.

However, rather than focusing on what had previously been done to review and develop housing plans, the new model set about asking what the community needs would be and how they could be introduced before the planning of new commercial or domestic properties was approved.

By developing an area or declining a service from a region, simple questions on what the impacts are on the decision were made against:

- Hospitals and medical services

- Schooling and education establishments
- Transport impacts and system requirements
- How the additional or removal of services would impact cross-generationally?
- Added or removed value to the community identity?
- Places of worships across the diversity of the population
- Recreation and leisure facilities

By establishing this structured approach, this leads to a community input on their own community around the constraints of the space, budget and time. This helps to secure the right kind of commercial and retail properties in a balance with the domestic requirements of the diverse population. By setting this procedure behind housing and retail decision making, this made a major impact on the populous returning and the community ethos, not just for some but a quality of life FOR ALL.

Health – Bringing Renewed Life into the Community

Community health touches on many different services, departments and non-profit organisations, by interacting for the benefit of the community. Each of these departments must "Learn to work together with the Community's Support to generate justified decisions during planning and at times of emergency or crisis".

Whether they are responding to an outbreak of a disease or safeguarding against the threat of a future one, this approach and their ability to collaborate is essential to any success to repel the risk to the health of the community. "By being able to work together to predict future illnesses before the community becomes sick, by finding transmission patterns by visualizing real-time and historical threat data, these departments remain on the front-line to keep the community healthy, happy and enables a future of safe and stable growth".

By developing these shared insights across and central platform, this ensures that multiple audiences can stay readily informed and instantly prepared to fulfil their routine and emergency roles as needed. The community authorities can then reinforce this approach by establishing protocols at certain key moments or events so that should certain conditions occur, or situations arise, there is clear direction by those that are viewed to give the community guidance.

This builds confidence not only in the government authority but in the community as well, knowing that if the worst does happen, someone is there to provide help, support and guidance.

Having such a formal approach leads to the government body within the community being able to trust its emergency planning techniques, testing them regularly and visibly to the community public, demonstrating proficiency and competence.

So, what health support can be used to help with the community to negate homelessness?

A community that comes together to protect its own, is naturally stronger. No community or city can ever be truly 'Smart' whilst its own people fail to have secure housing or must

sleep rough at night.

As we addressed within the 'Safety' aspect of the document, a lot of physical and mental abuse takes place, but none more than by the homeless individuals themselves.

This aspect of homelessness is regularly overlooked. In a survey by the Health Audit in 2014, 80% of homeless people were reported to have mental health issues, with 45% of these diagnosed with a formal mental condition. The top three of these diagnoses were depression, schizophrenia and bipolar. Within the same survey, the source of many of the health problems was substance abuse, recording 62.5% of those questioned.

With the provision of a pop-up or mobile/virtual health support service, this would allow the services to treat the problem at its source. This temporary service would also be able to share the message to the community, but especially to those most vulnerable that they do matter and that society and those inside the services do still care.

Living on the streets means that living and working styles and conditions are much more fluid and change more rapidly, this environment of constant change must be managed more prescriptively.

Prosperity – Investing in the Community

"Communities prosper when they work together, supporting each other to identify market trends that can attract investments". Whether they are appealing to potential residents or businesses, economic development planners help communities grow, by emphasizing the importance of the right investment in the right location to maximize its worth.

In competitive environments where neighboring communities or cities vie for capital improvement funding, tourism and much needed revenue, the economic planners must demonstrate the potential for a clear and substantial value of a new development site and commercial property. To be truly successful, they must demonstrate to the community, government bodies and local commerce enough relevant and accurate data to entice its citizens through insight into the changes that such an investment can make to their lifestyle and demographic characteristics.

To better prepare a community for prosperity, identifying and connecting the right investors and entrepreneurs to the right information so that they have time to recognise and implement such investment opportunities. By having the right people understanding the changes to the needs and demands of the community, this can encourage those willing to invest by offering this information to obtain greater visibility of the opportunity being offered. This will then avoid chance, or blind investment into the community based on hope rather than fact leading to regular foreclosures and reduction in the attraction of the community's home.

This regular turnover of business can create disharmony and start to affect house prices and the popularity for mobility into the area, instead in some cases, causing a prolonged exodus. "Community prosperity means FOR ALL and not just for the few, creating an environment of growth that does not discriminate against individuals, therefore reducing

or in some cases eliminating poverty within the community".

This however can only be achieved with stable Financial Sustainability Planning.

The planning needs to be viewed both on a long-term and a short-term basis. The community needs to know their finances for six months to a year, but then to challenge itself to plan where it would also like to be in five years. Financial sustainability planning is only one part of the plan, allowing the community to concentrate on their real purpose and to focus on its achievements. The community should never lose focus on why it is there and what it stands for, it should never lose its traditions or its identity.

So, how does a community encourage investment to help reduce homelessness?

It is said that all investment is good investment, but this is not always true.

UN Envoy, Philip Alston assessed the UK Government and after the years of investment, where the issues still exist. His key findings were:

- Austerity - Alston was critical of the "mentality" behind cuts and reforms introduced in the past few years that have brought misery and torn at the social fabric. "British compassion for those who are suffering has been replaced by a punitive, mean-spirited and callous approach …"
- Universal credit - The government's ambitious programme to simplify the benefits system was a good idea in principle but was "fast falling into universal discredit" and should be overhauled. It was gratuitously punitive in its effects. Draconian sanctions and long payment delays drove claimants into hardship, depression and despair.
- Brexit - The most vulnerable and disadvantaged members of society will take the biggest hit from Brexit, Alston said. People felt their homes, jobs and communities were at risk. "Ironically it was these very fears and insecurity that contributed significantly to the Brexit vote."
- Who suffers? - "Changes to taxes and benefits have taken the highest toll on those least able to bear it," said Alston, with the costs of austerity falling disproportionately on the poor, women, ethnic minorities, children, single parents, asylum seekers and people with disabilities.
- Holes in the Social Safety Net - Massive cuts to council funding, alongside big rises in demand for social care, had reduced many local authorities to providing basic services only and had heralded the closure of libraries, parks and youth clubs. This was "damaging the fabric" of British society and eroding its sense of community.
- Poverty - Alston said the UK government had told him the social support system was working and there was no extreme poverty in the UK. But the individual testimonies he received during his visit told a different story. "There is a striking and almost complete disconnect between what I heard from the government and what I consistently heard from many people directly, across the country."
- A Digital Welfare State - The government's embrace of digital technology and automation was especially visible in universal credit, where the digital by default approach excluded people with no internet access or skills. "We are witnessing the

> gradual disappearance of the post-war British welfare state behind a webpage and an algorithm," Alston said.

With this all considered, it is important to recognise that it is only when it is targeted investment that real value is gained.

What is regularly forgotten is that it is not simply financial investment, but the capacity and effort investment where the community has the potential to support itself through to develop growth and to minimise waste. Through a thorough education programme of all the people in the community, it will start to understand and appreciate what it already has before it continues to ask for more.

The exercise of the inventory of the social, financial and welfare assets within the community, whether public or private, would also assist the authorities with a clearer picture of its holdings before requesting or implementing unnecessary investment. As the Smart ethos is also designed around the 'FOR ALL' approach, having the community and the authorities working collaboratively to reduce the housing problems should encourage greater involvement as everyone within the community gains from even the smallest investment.

Whether the investment is through reuse or renovation of buildings, or new builds and new developments, the community knows what and more importantly, why changes are being made to their landscape within the constraints of budget and time.

This open transparency would motivate the community into wanting to improve their own as well as the remainder of the region's quality of life.

Sustainability – Building a Community for Future Generations

To maximize sustainability, communities must connect with their government bodies to work together to fight deforestation, uphold the community values and health and to preserve the living standards FOR ALL.

When it comes to urban planning and design, they should use technology to balance competing interests, to fuse data from numerous sources and to communicate their intentions for the community across multiple audiences. However, one thing is as true today as it always has been, "If you want to pass a message to others, understand your audience". Too much technology can be equally as bad as not enough, so know who you are sending what message to with what media.

Those sharing the messages should be able to acknowledge their own personal style of communication and then understand how that impacts the recipients (benefits/risks, why that kind of change is necessary now, what are the consequences in the future if the change will not be implemented etc.). "Only when the sender can actively listen through effective feedback can they then adapt the style or media of the communication so that it becomes appropriate to the situation and to the needs of their audience". By incorporating a strong geo-design into any planning, communities become better positioned to provide their citizens a more sustainable future without compromising the usage or the quality of its

land, water or air.

With the use of the Smart Modelling Concept, communities can benchmark their achievements and then measure progress as they implement change. It can clearly assist each community with the recognition of its successes and identify where further improvements need to be made.

By utilising the Smart Metrics approach to change they can measure and then mature their approach in the six separate areas of community sustainability focusing on what matters to the community, when it matters.

The six areas of measurement are:

- Organisation Sustainability
- Development Sustainability
- Financial Sustainability
- Governance Sustainability
- Logistical Sustainability
- Environmental Sustainability

Through the metrics matrix of 242 assessment points, each community can grow and shape itself into the community it wants to be.

So where would a community start and how simple is the model to integrate into their lives?

After a community has obtained the model and its relevant supporting documentation, the community must establish where it currently is and create firstly its baseline, before setting its goals for achievement. As the community drafts its original Strategic Smart Change Plan, it will begin to identify the approach it wants to take and how it chooses to optimise efficiency and to minimise its waste. No-one comes in and tells the community what it should be doing and there are no methodologies, just a simple framework, governed by them, implemented by them, delivering their needs.

“The secret behind a community, lays within the community and its people”.

By bringing people together the community and by understanding what they want to for their city, town, village or business this increases buy-in and the potential for further investment for the future generations.

However, nothing happens for free, so how can the programme itself become self-sustaining?

To deliver Year 2, the local authority will identify areas of income, enough that these efficiencies of improvement to make up 25% of the approved first year budget. With these efficiencies in place, this means that the national government contribution would reduce to 75% of Year 1. This iterative process will continue year on year with the national contribution reducing by 25% per year until the local authority programme has

become self-sufficient. There are two caveats to this Smart Solution Model being successful. Firstly, the funding allocated for the programme must be ring-fenced and all efficiencies identified by the local authority, remain local. By having this fixed budget approach, the national government will know its time limited financial commitment and the local authorities will be empowered to make real life changing decisions on the ground without fear of funding withdrawal or reduction because of their identified savings.

In this way, the local authorities can offer greater scrutiny to all its assets and find a more efficient manner of doing business in the future.

IMPLEMENTING THE COSI APPROACH

The COSI approach was identified specifically to assist with the homelessness issue.

This simple four-step process gains a clearer understanding of the situational requirements which can lead to more meaningful results. Let's look at each step of the COSI approach in greater detail.

C – Challenge – The largest misconception of the homeless is that they are branded all the same and that they have brought this problem upon themselves. This could not be further from the truth and so this must be challenged at all levels of the community to remove this crude mistruth. The typical campaign and advertising will and has only had limited impact and so it is essential that the local authorities find a way of engaging on a one-to-one basis with this social group to gain a clearer understanding of who they are, what their personal history is and what skills or services they can feed back into the community. By giving this time and attention, the authorities will obtain a clearer picture to enhance their strategy and the individuals themselves will once again, begin to feel valued.

O – Observe – We learn so much by watching. By recognising the behaviours and the traits being conducted by the social group that require support, this promotes good behaviours by the individuals and can equally identify those that are devaluing the support, or far worse, sabotaging the process. This directive/supportive leadership style maintains control of the process but assists those that might struggle at first with this change, to what has become their 'new norm'. By guiding the individuals through this change on an individual pace basis, the process will achieve its critical mass to alter the perception of those in the social group but also those in the wider community.

S – Solution – Solution development on an individual or a group basis is a real challenge and must be done only when the solution is right for those impacted but also by those within the right environment to understand the right solution. Therefore, the solution model to assist with decision making should be the six-step problem solving process.

The process is a structured, systematic approach to solution development and making improvements. The benefits of the process include:

- To ensure consistency
- To keep the process more scientific and less susceptible to individual biases and

perceptions
- To provide a focus for the group and to help set the agenda

Following the method and using its data to make decisions makes it easier for a group to reach consensus and solve problems more effectively. This model will make solving problems easier and ultimately yield a better result. It makes the authority test all ideas and eliminate those which are not correct for a scenario. The model uses a series of logical steps to help identify the most important causes and the best solution, this creates a systematic approach to problem solving. It allows for decision making based on data, rather than hunches and determines root causes of problems, rather than reacting to superficial symptoms. This approach devises permanent solutions, rather than relying on quick fixes.

Although many problem-solving models can be highly sophisticated and technical, this model uses six simple steps, so the strength in its simplicity. The model is comprehensive enough to address all but the most complex of technical problems and so would be highly beneficial for the resolution of people related or business-related problems.

The six steps of the process are as follows:

1. Identify the problem you want to work on
2. Gather relevant data associated with the problem
3. Clarify the problem
4. Generate the multiple possible solutions
5. Select the best option as the workable solution
6. Implement the decision and then monitor the results of the actions

By using this thorough solution modelling method to enhance the decision-making process, everyone can be matched to the correct action plan. By applying the right solutions to the right problems, the issues causing the problems are less likely to reoccur.

I – Integration – Fixing the problem is only half the result that the local authorities will be looking to achieve. Having resolved the problem firsthand, there requires to be an authority led self-supporting network to ensure those from the social group that have been brought through the system, do not fall back into it. This network would become the bridge between their previous life and their new improved lifestyle.

This coordinated approach would use ‘Champions’ stories to promote and sustain the programme as individuals would be able to work with other community members and the local authorities to grow the scheme giving those in the systematic process greater belief that there is a better life if they work with the system to improve their and the community’s quality of life.

COMMUNITY MODELLING MATURITY

Much as no one individual works at a single pace, neither do communities or authorities. By having the Smart Solutions Maturity Model to grow the approach and to measure the metrics against, each local authority can develop their own strategy with long-term

objectives and not short-term quick gains at the forefront of their planning.

By using the maturity model as the baseline metric for the development of the approach, this allows the national government to see what progress is being made by comparing local authority's performance. This approach to maturity modelling allows the local authorities to also make a key decision at the earliest stage of the programme, what level do they want to reach and why that is beneficial towards not only the programme but also to their own local authority.

By having this choice, each authority can be involved in the programme but never to the point that it becomes detrimental to the rest of the duties of the authority. Each step of the maturity model is self-explanatory and so following it, measuring against it and then progressing and achieving each grade allows for an internal strategy that can be aligned so they develop their own self-sustaining programme of works and financial management within the full enhancement approach.

Success is measured in many ways. The key measure will be the enhancement of the quality of life achieved by the local authority, with the support of the community committee for the benefit 'FOR ALL'.

The five stages of the maturity model have been designed around the Gartner Model and will help any organisation appreciate their sustainable leaders set strategic goals that are appropriate to the level of maturity them demonstrate.

Organisations often find it very difficult to define accurately what their passage to sustainable excellence should look like. This passage or route to success, typically involves the development of several operational capabilities, but without a clear defined framework of delivery, operational and business leaders may find it challenging to focus on the right areas at the right time for their business or organisation.

The passage to sustainable excellence is partly defined by the organisation or business' own level of maturity, however using the Smart Maturity Model based around Gartner, then the business leaders have a five stage maturity model against which they can measure their own organisation's maturity to allow them to develop a clear, long-term vision.

Most leading businesses and organisations consistently take their maturity-based approach to design and execute their own strategy. Having the five steps allows the leaders to have a greater understanding of what they can achieve whilst plotting out a future for what, if they continue to mature, they may be able to achieve in the future. These stages will help set a strategic goal that is appropriate to their own organisation.

Level 1 Reactionary Sustainability - This stage is characterized by separate individual departments, such as housing and welfare, driving sustainable priorities via manual independent processes and disparate, disconnected systems. There is no cross-functional standardization of the sustainability approaches for services offered internally or externally with little to no coordination. For example, the housing department might introduce a new regime within their department about closing all non-essential equipment and power at the end of the night, but not share this within the remainder of the

organisation. The advantage of having level one in place is that the organisation or business will be making advances with their sustainable approaches but unfortunately, being so separated and random, this does not typically materialise in long term success itself.

Level 2 Anticipatory Sustainability - With a centralised function for sustainability, there is a clear improvement of efficiency and productivity. Sustainable activity and performance are captured and reported using an organisational-wide system or model, enabling better anticipation of the changes occurring. At this level, there is a new focus on creating a standardised approach to sustainability processes and methods that benefit from the right economies of scale with increased efficiency. The sustainable performance is internally focused on the return of investment to the effort being applied to implement these approaches. This improvement starts to show the improvements for the organisation, this should heighten the interest in sustainability as a subject within the business. However, without having the formal visibility to the world that sustainable actions are making a difference to the business, this remains a limited benefit.

Level 3 Integrated Sustainability - The focus now is on integrating the sustainability function into the whole business. There is increased consideration of how sustainability will affect business processes, customer service, procurement and production. Productivity enhancements and cost reductions are now achieved through connections to partners and third parties through strong project, supply chain and business providers. Now the full business structure is showing great change. Having a full integration and recognition of the sustainable practices both internally and with partners leads to a greater motivation in the business and their partners to ensure that everything that the business does, has a sustainable theme or feel to it.

Level 4 Collaborative Sustainability - By this stage, sustainability is an integrated part of all aspects of the business management vision, with trade-offs balanced between sustainability, profitability and community satisfaction. There is collaboration and visibility with partners, suppliers and customers, as well as strategic partnerships with business providers that go beyond simple transactional and become more transformational services. Business and sustainability capabilities are reliable enough to consider opportunities to start to change the shape of your organisation or market requirements. By level four, the business, its partners and providers are proactively working with each other to create a working practice that brings together the companies in a way that is beneficial for all.

Level 5 Orchestrated Sustainability - Sustainability and the rest of the business and supply chain facilitate processes across an eco-system of partners to capitalize on and creating unique business opportunities. As a result, information flows across the business and supply chain network in real time. This enables broader visibility and timely, fact-based decisions, which increases market share and growth opportunities.

Optimized sustainability within an organisation now gives it an advantage to search for the sustainable change and to shape the future for not only their company but also the industry in which it finds itself. Having optimized the financial, social and environmental approach with its partners and providers, it can now start to lead the industry with a strong

recognition for change at the right time and in the right way.

CONCLUSION

So, after twenty-three pages and over eleven thousand words, there is a clear and compelling argument that we need to do something and that we need to do that something now. The problems that have existed for so long, even with all the help that has been offered and all the funding that has been expended still has not broken the back of the problem. However, there is a fundamental reason why everything that has happened before has never gained true success and has left us in the position that we find ourselves today, a simple missing ingredient to all the well-being and the time and effort that has been shown, coordination.

Today, we have more charities and social welfare groups helping and supporting these challenges, yet we are missing one single aspect, a national body that takes control of the approach that is needed to create one standardised, centralised drive towards a sustainable solution. By designing this approach and having a central point of control, the funding is better controlled, the time and resource allocation becomes more efficient and those that need the help the most, get it when they need it more swiftly.

There has been a drive in the country to remove homelessness and street sleeping for several years now, and it is essential to bring this finally to fruition. By applying the approaches within the paper and with the strong coordinated approach lead from the national government, we can start to plan to bring an end to these problems that have blighted our country for too long.

What has made the country so strong before and will again, is the can-do spirit that we have, if we recognise that it is being genuinely heart felt and led from those in charge. With the correct targeted advertising campaign, aimed at the areas that need it and then managed around those that are in the greatest danger, we can provide a great opportunity for the national government to drive a new brighter future for the next generation of British citizens, not a few, not a specific minority or ethnicity, but a greater Britain, FOR ALL.

The plans and approaches have already been introduced into a school within Nairobi as part of the United Nations Democracy Fund and those that have been offered the help have shown nothing but pure gratitude and a drive to want to help others more. By invigorating those that feel they are part of the problem, they feel they become a part of the solution and have a value that they can give back to society.

However, where so many organisations and businesses have used instability in the economy as an excuse to avoid investment, this is a moment, something that many will probably never see again in their generation, a moment when with the right people, working in the right places and making the right decisions, can drive Great Britain back to the summit that it belongs.

Consider, as one option, that if the homeless can be taken off the streets, placed into graded housing so that they can work through a scheme where they can not only give back to their own community but also offer additional services to the community, then the country

will have a new pride that gives and receives, where community life matters and where we learn to care about more than just ourselves once more. A dream, perhaps a utopian idea, or is it? Why should it not be possible to make everyone happy, through involving everyone in the decision making and in shaping their own environment.

It is the PEOPLE that are impacted by their own living environment and so it is those people that should identify and drive the change making them feel individually responsible and committed to their community. Whether the end goal is increased safety, greater efficiency, a higher quality of livability, stronger health, greater prosperity or a cleaner environment, being truly SMART as a community is about those that live there.

There is a simple message to everyone that wants to make the change and to make a real difference for this and for future generations. The answer is not to live in an endlessly changing, damaging environment, but quite simply we need to ‘Think SMART, Act SMART and Live SMART’.

UMD Project Management Symposium

Challenges in construction project management as faced by millennials in Egypt as a developing country

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ABSTRACT

Basically, this presentation will show what is happening in the industry in developing countries Vs USA and how does a millennial look at it and fit into it. As we all know that the culture of each country is one of the major aspects to take into account in stakeholder management when referring to millennials; whether they manage a project team or they are being managed by project leaders. No doubt that each country has its own different working environment.
In developing countries, the culture and the nature of each project play an important role in CPM. Currently many case studies show that it's not anymore about the waterfall process or the new agility techniques that matter, however, it's about how to be creative and adapt to the nature of each project in all its circumstances since each project varies in its location, time, budget and resources.
Of course, it is very beneficial to study theories but also its more important to learn from our mistakes and be down to earth; maybe we can think of new holistic approaches or come up with a model that can be used later as a tool for managing each project independently.
Also, this paper aims at understanding what challenges are, how they are formed and how they are perceived by millennials. Research involves doing a deep dive study into the mindset of millennials at the industry today and the understanding of major concerns of the industry.

INTRODUCTION

“Project” is a temporary endeavor undertaken to create a unique product, service, or result, as defined in PMBOK guide sixth edition. The keyword in this definition is the word “unique” because one has to understand that each project has to be treated independently based on many factors in order to fulfill its objectives successfully and attain its strategic position.

From my experience, managing projects in developing countries has become very challenging especially in the construction industry as the waterfall project life cycle has to integrated and all project team and stakeholders have to understand the terms adaptability and flexibility.

All project managers are aware of the project life cycle and how projects are being managed throughout all the knowledge areas and process groups.

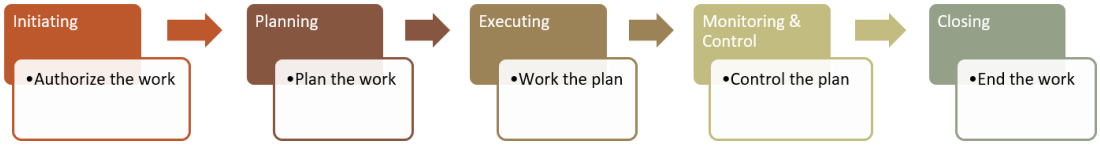

Figure 1. Project Life Cycle

This paper will mainly focus on the challenges faced in developing countries and the importance of having a new generation of flexible and creative project managers in the construction field. And accordingly, the paper will review the changes happened in the science of project management that is now reflected in the PMBOK sixth edition.

EVERYTHING IS CHANGING

Project Management Institute noticed that the distance between what is really happening in the market and theories written and studied in books started getting wider so they tried to respond to bridge the gap. And from here, all changes happened from PMBOK 5th to 6th took place.

First of all, some control processes have been renamed. They exchanged the word control with the word monitor which gives more sense of empowerment than controlling. As PMBOK 6th edition is focusing more on adapting, facilitating and monitoring.

Figure 2. Processes that have been renamed

Second and more importantly, they started highlighting the concept of tailoring in project management. Project managers were used to apply their practices and follow certain methodologies developed by experts within the organization. However, "Good practice" does not mean that the knowledge described should always be applied uniformly to all projects. In tailoring, the project manager has to collaborate with the project team and all stakeholders.

Also, tailoring should address the competing constraints of scope, schedule, cost, resources, quality, and risk. The importance of each constraint is different for each project, and the project manager tailors the approach for managing these constraints based on the project environment, organizational culture, stakeholder needs.
Sound project management methodologies take into account the unique nature of projects and allow tailoring, to some extent, by the project manager. However, the tailoring that is included in the methodology may still require additional tailoring for a given project. *PMBOK Guide sixth edition P.28*

Additionally, new outputs were released as part of the ITTOS (inputs, tools & techniques and outputs) like the new lessons learned register. And a new chapter for Project manager roles and responsibilities is added which is effectively aligned with the PMI talent triangle and current best practices. Also, significant emphasize is given to Agile practices and its integration with all knowledge areas. Plus, the release of agile practice guide along with the PMBOK.

Finally, from time to schedule management**.** Schedule management is now replacing the term time management as time is a very broad word that doesn't ensure carrying out planned activities in a timely manner.
The process of estimate activity resources has been moved to the project resources chapter.

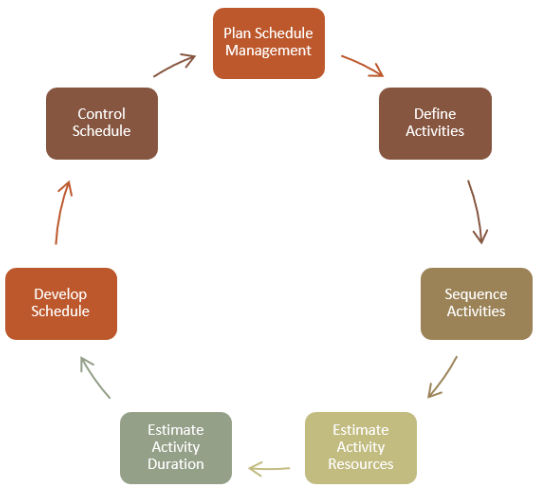

Figure 3. Project Time Management Processes

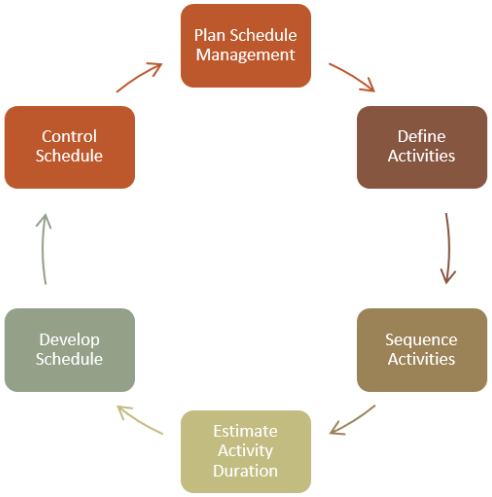

Figure 4. Project Schedule Management Processes

CHALLENGES IN CPM

PMI research indicates that technical skills are not enough in today's increasingly complicated and competitive global marketplace. Organizations are seeking added skills in leadership and business intelligence. Members of various organizations state their belief that these competencies can support longer-range strategic objectives that contribute to the bottom line. To be the most effective, project managers need to have a balance of these three skill sets (leadership – technical skills – strategic and business management)

In developing countries, the construction industry is one of the fast-growing industries among all others. Commercial zones, corporate buildings, recreation areas, infrastructure projects and all types and scales of real estate projects are all counted.

As all project managers know, for a project to be successful it has to balance between these three major constraints; time, cost and quality. However, this is very challenging to be achieved. Unfortunately, in developing countries business men always invest money in mega projects for development. So, the project manager always risks either the quality or the project timeframe because it has to stay on budget. And if a specific project will get high exposure, then it will never be submitted on time because the quality can't be sacrificed in this case.

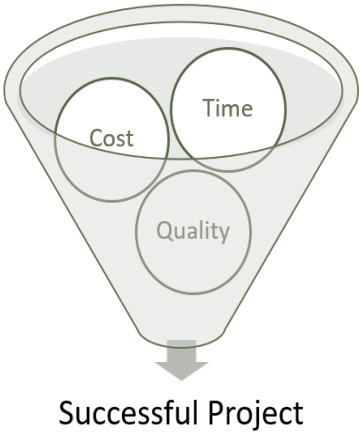

Figure 5. Quality Triangle Project Constraints

One second reason for a project to be behind schedule is that sometimes the delivery date is set without previous planning or research. The one setting the date is not the one who is in charge to study the project. Accordingly, all scope and schedule management processes are reversed and that is called the crashing technique in which it requires adding resources.

Another key challenge in developing countries is that most of the time the scope of work is not well defined or is changing frequently and this messes up all the scope management processes and accordingly schedule management again. I believe that this happens because the project charter is not studied well or was not shared with all stakeholders in the project.

EXAMPLES OF MEGA PROJECTS IN EGYPT

Example #1: Tactic Village

Client: Ministry of Interior
Location: 6 of October City
Area: 8.4 km²
Start Date: 2010
Completion Date: December 2017

Figure 6. Tactic Village, the administration building

Project Brief: On End of November 2014, it was announced that all the village will be submitted in 6 months.

Project Components: 3 types Residential – administration – classroom building – tribune – hospital – 2 types of simulation buildings – Shooting range building – mosque – services building – Sports center

Challenges:

- Scope was changing every time the contact person changes at the ministry of interior.
- Had to adapt on the submission date that was announced on TV in an interview with the minister of interior
- Asphalt item was totally forgotten that was about 6 Million EGP to be added in the BOQ
- No enough human resources to deliver this amount of work on time.

Example #2: New Administrative Capital

Client: the government
Area: 714 km²
Start Date: 2015

Location: New Cairo
Budget: above 20 billion dollars
Completion Date: still in progress

Figure 7. New Administrative Capital - Master Plan

Figure 8. New Administrative Capital - Phase 1

Figure 9. New Administrative Capital - Phase 1- District 3

Project Brief: Egypt Economic Development Conference (EEDC) was a three-day event that took place on March 13, 2015 in Sharm El Sheikh with over 2,000 delegates from 112 different countries. On the first day, a proposal for a new Egyptian capital city was announced for investment and economic development.

Challenges:

- Project submission date was announced without any previous studies
- Investors need to see their return on investment as quickly as possible (time is money)
- Referring to the cost – quality and time triangle, cost and quality couldn't be sacrificed and that's the reason that makes the project till now is still in progress.
- No enough human resources to deliver this amount of work on time.

Example #3: New Suez Canal Branch

Client: the government
Area: 72 km length
Start Date: August 2014
Location: Sinai
Budget: 30 billion Egyptian Pounds
Completion Date: July 2015

Actual dredged quantities according to progress of works	258.8 million cubic meters
Duration of execution	12 months, including mobilization of dredgers
Consortium's first dredger to be employed in the project	Dredger "Al-Marifaa" on Nov. 5th,2014
Quantities of Dry excavation works	250 million cubic meters
Highest daily rate of dredged quantities was achieved by dredger "Ibn Batouta" on April 6th,2015	230,000 cubic meters
Highest daily output of dredged quantities was achieved on May 31th ,2015	1.73 million cubic meters
Number of dredgers employed in the project	45 dredgers
Number of sedimentation basins	20 basins

Figure 10. Suez Canal Branch – Facts and Figures

Project Brief: Creating a new canal, parallel to the existing one, to maximize benefit from the present Canal and its by-passes, and double the longest possible parts of the waterway to facilitate traffic in the two directions and minimize the waiting time for transiting ships. This will certainly reduce the time needed for the trip from one end of the Canal to the other, and will increase the numerical capacity of the waterway, in anticipation of the expected growth in world trade.

The project cost around 30 billion Egyptian pounds and no foreign investors were allowed to invest in the project, but rather Egyptians were urged to participate in funding the project through bank certificates of deposit initially yielding 12%, later raised to 15.5%.

The Egyptian armed forces helped in digging and designing the canal. The enlarged capacity allows ships to sail in both directions at the same time over much of the canal's length. Beforehand, much of the canal was only one shipping lane wide, with limited wider basins for passing. This is expected to decrease waiting time from 11 hours to 3 hours for most ships, and to increase the capacity of the Suez Canal from 49 to 97 ships a day.

Challenges:

- It was announced that the New Suez Canal project will operate after a year (instead of three years). As the revenues of the canal will increase from 5 billion dollars to 12.5 billion dollars annually.
- Construction of the rest of the projects (which include building the city, industrial zone, technology valley, and fish farms) began in February 2015.
- Technical difficulties initially arose, such as the flooding of the new canal through seepage from the existing canal.

CONCLUSION

Project management is change. And change drives an organization's ability to remain competitive in its culture. It's a key strategy going forward. And the ability to manage that change successfully separates good organizations from ones who are not competitive. Also, having an organization that can innovate in process, in product and in technology mean that they can remain competitive, and they can drive the change that they need to stay relevant in the marketplace. And, most importantly, how we use scarce resources to drive projects successfully and deliver the right results. So, if you take these three foundational tenets; change management, innovation and organizational alignment and you blend them together along cultural aspects, that basically is the foundation for a successful project management.

Millennials value culture as much as money. Also, Organizations that are looking to attract the best talent need to realize that waving dollars under people's noses isn't the most important thing anymore. Building a psychologically safe culture where great work flourishes, is.

Unlike previous generations, Millennials aren't prepared to put up with poor culture. Their average tenure is currently just over two years, yet when they find an organization that places great emphasis on their wellbeing and development, they will reward it with loyalty and continual innovation.

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From Risk, to Issue, To Crisis: Is Your Program Prepared?

Deidre C. Hicks, U.S. Census Bureau,
Assistant Division Chief, Decennial Census Management Division

As program and project managers, we are all raised on the idea of managing risks and issues. It is a part of our DNA to identify and manage risks, including developing mitigation plans to try to avoid the risk and developing contingency plans in case a risk is realized. We are also well versed in issue management—whether it is a realized risk or an unplanned event. We know that the success of our projects and programs is dependent on utilizing a structured risk and issue management processes. What about a crisis?

More importantly—what is a crisis? Prior to the COVID-19 pandemic, the word was abused in our society—not having coffee available in the morning was a crisis to some, or a question from senior leadership or oversight entities, or news coverage of your program was viewed as a crisis. Those things are simply events and not a crisis.

A crisis is "a catastrophic event, or series of escalating events, that threatens the strategic objectives, reputation, or viability of the program or its parent organization."

While crisis management is related to risk and issue management, crisis management has its own set of international standards and best practices. Please note that crisis management is focused on how an *organization* prepares for, manages, and is impacted by a crisis.

Good examples of a crisis include Hurricane Katrina and last year's Boeing 737 MAX airplane crashes, as well as the current COVID-19 pandemic.

What do these events share that make them a crisis? It is how these events affect the program or organization responsible for managing the program when:

- Objectives are not met.
- Reputation is severely damaged.
- Viability of the organization is threatened.

So what about your program? Do you need to consider crisis management? I would urge you to ask yourself: Do I have any risks that, if realized:

- Could jeopardize lives?
- Would break the law?
- Would jeopardize the reputation of the organization?

If you do, you should consider implementing a formal Crisis Management process.

On the 2020 Census Program, we recognized that we were carrying several risks that, if realized, could become a crisis. We also knew from previous censuses that something was going to go wrong and, depending on the timing, could become a crisis. In late 2018, we decided to establish a formal Crisis Management process. We worked with our contractor/partner Deloitte, who brought to the table a Certified Public Sector Continuity Professional (CPSCP) and a Business Continuity Professional (CBCP) to assist us in developing processes that are based on best practices.

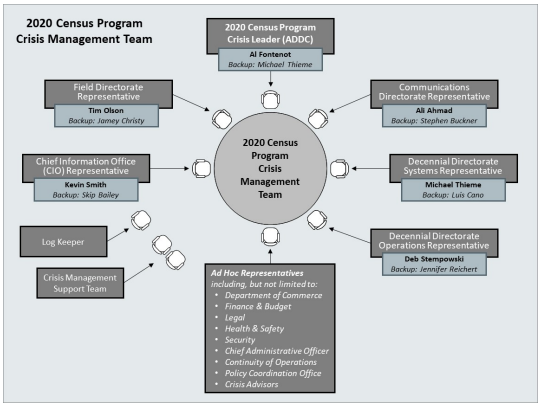
So how does a crisis differ from business as usual?

- Business as usual means that information sources are of known quality, but in a crisis, information is incomplete.
- Under normal circumstances, past experiences (such as trusting your gut feeling) will help you, but in a crisis, you're in a completely new world and relying on instinct can make a bad situation worst.
- Normally, cause-and-effect decisions are predictable, but in a crisis, decisions are full of uncertainty.
- Under normal circumstances, you already have defined roles and expected actions to take, but in a crisis, the roles are fluid and actions may have never been done before.

Maybe you are now realizing that your program needs formalized crisis management. Please know that crisis management does not replace existing response plans or duplicate processes such as your Continuity of Operations Plan (COOP). What it does is:

- Provide an overarching framework for managing a crisis.
- Document the process to anticipate, prepare, respond, and recover from a crisis.
- Identify existing response plans and describes the integration point with these plans.

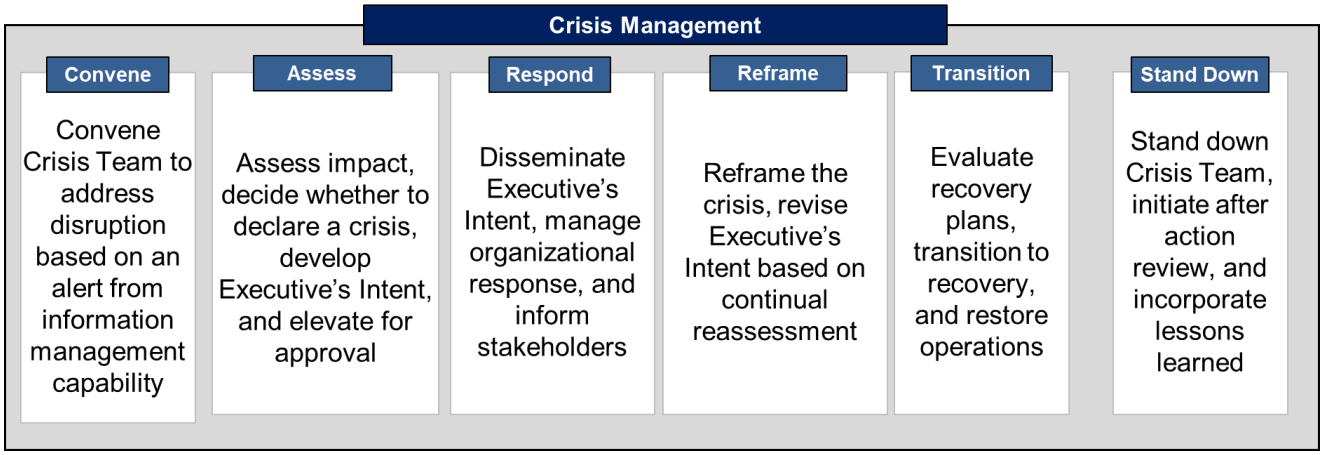
The goal is not to develop a contingency plan for every potential scenario that could occur, but to develop plans for every potential impact. Meaning, you may be able to think of 500 different ways your staff could be prevented from working in your buildings and the 501st thing actually occurs. What is important is not that you identify the specific cause of the event, but that you have a plan for the affect.



The chart above is a notional depiction of the Crisis Management Team for the 2020 Census including ad hoc representatives who are added to the team depending on the scope of the crisis.

The Crisis Management Team should generally be formed from the main body that provides strategic vision and has the authority to make decisions in a crisis. Additionally, people with the appropriate level of authority, experience, and capabilities should be appointed to this team. Beneath this team should be a hierarchy of teams, including both tactical and operational teams. To summarize, the Crisis Management Team is comprised of decision-makers, and the others who work for these people are the implementers.

Now I will walk through the major process steps for crisis management:



The first step is to formally convene the Crisis Management Team. This occurs when an alert has come through your normal information management processes and systems and the Crisis Management Chair determines that the team needs to be convened.

Once the team is convened, the focus is on assessing the impact to decide whether the situation is indeed a crisis. If a crisis is declared, then the team must develop an executive intent. What is an executive intent? It is a high-level statement that is used to communicate to key stakeholders, employees, and potentially the public the goal of the program to address and recover from the crisis.

The executive intent is critical to crisis management because it is the prime directive (for you "Star Trek" fans) that guides all decision-making. It is so important that I'd like to spend a little time discussing executive intents.

The following are real world examples of an executive intent:

"It's our responsibility to eliminate this risk – we own it, and we know how to do it."

The first example came from the Boeing CEO during the 737 MAX airplane crashes in 2019.

"Be completely transparent during a cyber breach."

The second example came from the Home Depot CEO during a cybersecurity breach that occurred in 2017.

"There will not be another attack on US soil."

Another example came from the FBI Director after 9/11. Relevant to this discussion, 2020 Census executive intent is shown below.

United States Census 2020

"[We will] not take actions that consciously contribute to the spread of the COVID-19 virus, while fulfilling our constitutional mandate to conduct a complete, accurate, and on-time Census."

Returning to the Crisis Management process, the next step for the Crisis Management Team is to respond to the crisis. That includes disseminating the executive's intent, managing organizational response to the crisis, and informing stakeholders. For the 2020 Census, stakeholders includes the Department of Commerce, Congress, the White House, and the public through news releases. In addition, during this step the frequency for follow-on meetings is set.

The Reframe step of Crisis Management is when you are actively managing the crisis. During this meeting, the Crisis Management Team will get updated information, reassess the circumstance, and potentially revise executive intent—crisis management is not just one meeting and then you are done. The crisis team uses these meetings to assess and evaluate recovery plans and make adjustments as needed. Any decisions made to redirect the program are disseminated through normal communications channels, including updates to the Risk and Issue Board, change requests submitted to the Change Control Board, and the continued dissemination of information to stakeholders that we discussed in the Assess Phase.

At some point, the crisis team begins to transition to recovery. The transition phases are underway once you are moving toward restoring operations or implementing the "new normal" for the program.

Finally, you cannot stay in crisis mode forever. The team does stand down, which also includes initiating an after-action review and lessons learned. It does not mean the event is over, just that we are moving forward under the "new normal." I also would like to highlight that from the very first meeting, a best practice is to discuss what the conditions for stand down will be and then revisit those in subsequent meetings. It is important for the Crisis Management Team to keep its eye on the end game so that everyone clearly understands when the crisis is over and life in the "new normal" begins.

The success of crisis management is highly dependent on conducting training exercises. If your program is critical enough to need crisis management, then you must plan and budget for exercises. Human nature always devolves to chaos in a crisis if you have not built in muscle memory. Therefore, it is crucial that you include all members of the organization who may be involved in a crisis and conduct exercises that increase in complexity from tabletop to scenarios in a scripted environment leading to interactive simulations.

The more you exercise, the better the response will be in a real event.

The 2020 Census program conducted tabletop exercises beginning in May and going through September 2019. From November 2019 to February 2020, we held more complex scenarios that exercised all of the steps of crisis management. Our last exercise was held in late February, and our Crisis Management Team members all agreed that they would have benefited from more exercises.

Now let me begin by giving you an update on the status of the 2020 Census in terms of the COVID-19 pandemic.

- Prior to the start of operational activities, our risk register included a major disasters risk that covered everything from terrorism, hurricanes, earthquakes, and pandemics.
- On March 9, the Risk and Issue Board discussed establishing an issue regarding COVID-19.
- On March 10, Al Fontenot, the Census Bureau's Associate Director for Decennial Census Programs, convened the Crisis Management Team and declared a crisis. The next day

the World Health Organization officially declared the novel coronavirus outbreak a pandemic.

- On March 12, mail began to be delivered inviting the public to self-respond to the census via the internet, phone, or through the mail. Those activities are ongoing and will continue throughout the data collection process. The good news is that currently more than 60 percent of households have responded to the census.

Guidance issued by the Office of Management and Budget and the Office of Personnel Management has given federal agencies guidelines to resume operations on an epidemiologically sound, data-driven basis, adhering to the latest federal, state, and local guidance. The Census Bureau continues to monitor the changing conditions at the state and local level, and it will update its planned start dates for selected operations and in selected states, consulting with appropriate officials.

Information provided daily to the Census Bureau from the Federal Emergency Management Agency, as well as state and local authorities, will be used to guide Census Bureau decisions on timing. As a result, selected field operations will resume on a phased schedule on a geographic basis.

Under the adjusted 2020 Census operational plan, the Census Bureau is conducting a series of preparatory activities so that we are fully ready to resume field activities as we continue to advance the mission of the 2020 Census to ensure a complete and accurate count. In-person activities, including enumeration, office work, and processing activities, will always incorporate the most current guidance from authorities to ensure the health and safety of staff and the public.

By law, the Census Bureau will deliver each state's population total, which determines its number of seats in the U.S. House of Representatives and the local counts each state needs to complete legislative redistricting. Because of the delays, for the first time since the 1790 Census, we will not deliver the data as originally scheduled.

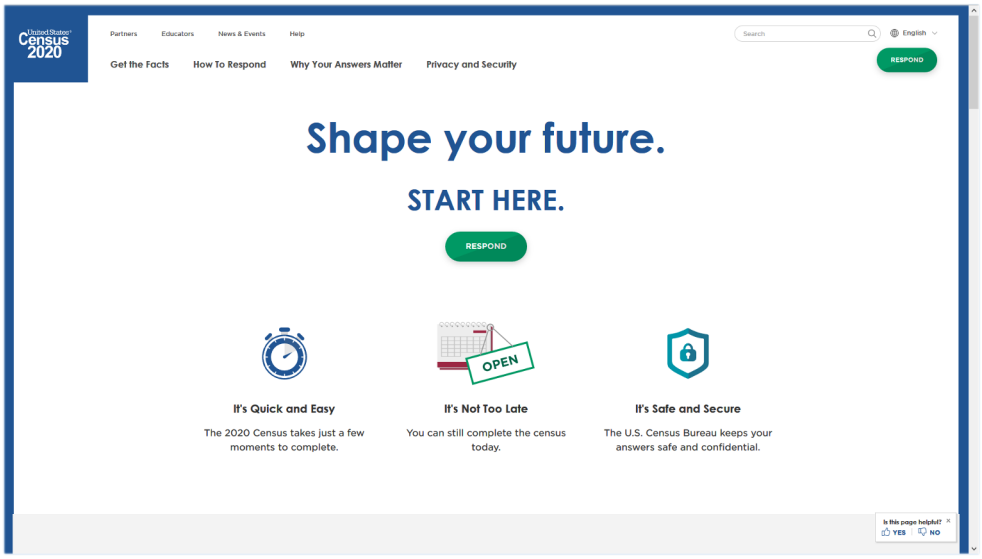
Deliver apportionment counts to the President

Planned Schedule	Revised Schedule
By December 31	By April 30, 2021

Deliver redistricting counts to states

Planned Schedule	Revised Schedule
By April 1, 2021	By July 31, 2021

The details of these decisions related to COVID-19 are shared publicly on the 2020census.gov website under News and Events, click on Press Kits. A quick public service announcement: if you have **not yet** responded, please do so through our website at 2020census.gov shown below.



UMD Project Management Symposium
When Will It Be Done?
How to Forecast Answers
To Your Toughest Agile Questions

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ABSTRACT

Just like a plan-driven project that uses a predictive project management methodology, agile product development is subject to the same project management "triple constraint" of scope, time/schedule and cost/resources. Although agile teams may no longer create detailed schedules, organizational leaders still want to know when their agile teams expect to deliver new value to their customers.

This paper will explore how to create a probabilistic forecast using a Statistical PERT® Normal Edition spreadsheet. Statistical PERT spreadsheets are freely licensed, Microsoft Excel®-based files that use the built-in, statistical functions inside Excel. Agile teams who use a probabilistic forecast are better equipped to align expectations with key organizational stakeholders. Armed with information from a probabilistic burn-up chart, organizational leaders and agile teams can make better decisions *today* to achieve desirable outcomes *tomorrow*.

INTRODUCTION

Agile teams do not work with detailed project schedules. Yet, most organizations continue to use projects to fund new software development efforts (the alternative is to continuously fund value streams without projects, much like organizations fund their core operational functions). For project-oriented organizations, their project charters authorize how long an agile team can work together on a specific project. The project funding should be equal to the cost of funding a dedicated agile team (or multiple teams for larger efforts) for the full duration of the project's schedule constraint. For the scope constraint, it is common for the project charter to offer high-level scope objectives for the agile team to complete and the business value that the organization expects to receive. The charter may also offer a high-level release plan or key milestones for expected delivery cycles, but these are often little more than guesswork on the part of those who drafted the charter.

Agile teams are (usually) long-lived teams and not subject to the same kinds of fluctuations in team member participation as project teams working on traditional, so-called "waterfall" projects. Agile teams, ideally, have all the skills necessary to plan, design, create, test, and continuously deploy new software into their organization's production environment.

Therefore, two of three parts of project management's so-called "Triple Constraint" are well understood for endeavors using an agile approach for product development: the schedule and cost constraints. What is unknown to the agile team and the sponsoring organization is how much scope can be completed within the time and budget constraints imposed by the project charter.

Specifically, organizations using an agile approach to new development must answer these scope-related questions:

- When will the project's scope *really* be finished?
- When can new, major releases of the product be ready for production deployment?
- How much scope (that is, new and/or enhanced features and capabilities) can be delivered by a certain date?

Answering these questions is important to project sponsors and organizational executives. Executive leadership of an organization is accountable for how they use the organization's available project resources, especially their employees' time and effort.

To make informed decisions on which projects to fund (and not to fund) and which product features to pursue (and not to pursue), product owners, product managers, and organizational leaders must have enough information available to assess the expected return on investment for each project and each new product feature. To do that, they need agile teams to provide reliable estimates for how long they think they need to work together to convert ideas listed on a product backlog into working software.

By providing product owners, product managers, and organizational leaders with a delivery estimate, it is easy to compute how much each major product release may cost:

Agile team weekly cost × Number of expected weeks to complete a product release

Although the equation is simple, what is *not* simple is accurately estimating how long it will take an agile team to convert ideas on a product backlog into working software.

This paper explores how to estimate when an agile team will complete new development efforts, whether that is an entire project or just a subset of the project's expected scope. Using the built-in statistical functions inside Microsoft Excel® and a freely licensed, pre-built spreadsheet called Statistical PERT® Normal Edition[1], an agile team can create product development forecasts that align delivery date expectations with product owners and other key stakeholders. These forecasts inform organizational decision-makers so they can make better decisions earlier to achieve desirable future outcomes.

ESTIMATING, PREDICTING, AND FORECASTING

In his book, *Upgrading Leadership's Crystal Ball,* healthcare economist and futurist, Dr. Jeffrey C. Bauer, makes a distinction between a **prediction** and a **forecast**. According to Dr. Bauer, these distinctions are highly relevant to business decision-makers who must make informed trade-offs about which opportunities to pursue—and which not to pursue.

Dr. Bauer offers that a *prediction* is "a specific estimate of the expected value of a key variable at a future point in time" (Bauer, 2017, pg. 4). He explains that a *forecast* is "an estimate of the probabilities of the possibilities for a key variable at a future point in time" (Bauer, 2017, pg. 4).

Note that Dr. Bauer uses the word "estimate" in both definitions. The Merriam-Webster dictionary defines an estimate as, "a rough or approximate calculation" or "a numerical value obtained from a statistical sample and assigned to a population parameter" (Estimate, n.a.).

A quick search on the Internet reveals that *estimate, prediction,* and *forecast* are variously defined, sometimes used interchangeably, and can differ from Dr. Bauer's definitions. However, it is possible to simplify Dr. Bauer's definitions without losing their distinctive appeal and develop accessible definitions for *estimate, prediction,* and *forecast.*

For the purposes of this white paper, an *estimate* is, simply, **somebody's idea about the true value of something unknown**. In the context of project management and agile product development, what is unknown is how long an agile team will work together to create working software out of the product owner's wish-list items appearing on the team's product backlog. If an agile team can estimate how long it might take to convert product backlog items into working software, the cost of that effort is simply the result of multiplying the team's weekly burn-rate (that is, the cost it takes to fund the agile team's working together for a week) with the number of expected weeks it will take to achieve some desirable objective, like completing a major, new feature request.

Similarly, a *prediction* is **somebody's *single* idea about the true value of something unknown**. This is a *deterministic* estimate because it represents just one possible outcome

[1] Statistical PERT® spreadsheets are freely licensed and available at https://www.StatisticalPERT.com

(usually the expected or most likely outcome).

Finally, a *forecast* is **somebody's *varied* idea about the true value of something unknown**. A forecast varies in the *possibilities* of what may occur and their respective *probabilities* of occurrence.

Most often, estimates of the future are created as deterministic estimates—single-value predictions of the future. But predictions of the future have two severe drawbacks. Firstly, a predicted value does not indicate how likely the prediction is. There is no sense of certainty or uncertainty about the prediction because it is only a single value with no corresponding probability of occurrence. Secondly, a predicted value does not reveal other possible outcomes. There is no sense of variation of alternate possible outcomes.

Without understanding the sense of certainty and uncertainty about project predictions, and without knowing the span of other possible outcomes that might occur, key stakeholders and agile teams cannot be well-aligned. Decision-makers who evaluate predicted values risk making poor decisions by not recognizing the complexity and uncertainty with creating new product features and the level of effort it may take to create new solutions.

Rather than share predictions with key stakeholders, agile teams can learn to forecast uncertain future outcomes. By sharing their forecasts with organizational leaders, agile teams can effectively convey their sense of risk, uncertainty, complexity, and required effort to convert product backlog items into working software.

METHODS OF ESTIMATING PRODUCT BACKLOG ITEMS

Agile teams commonly use relative sizing called *story point estimation* to estimate product backlog items. Large product backlog items which are too big to bring into the team's next iteration are called "epics." Smaller product backlog items that comfortably fit into the team's iteration are usually called "user stories." An "epic" is simply a too-big user story that, at the right time, must be decomposed into smaller user stories.

Another way to estimate product backlog items is not to estimate them all. Instead, some agile teams simply decompose "epics" into roughly the same-sized "user stories" before they begin working on them. Then, at the end of an iteration, they count the number of completed user stories. By knowing about how many same-sized "user stories" they can complete each iteration, these agile teams can estimate future performance by estimating how many decomposed user stories are represented on their product backlog.

It is beyond the scope of this white paper to analyze how teams estimate their product backlog items. Irrespective of how they estimate their work, they need a way to create projections—forecasts, in particular—to answer scope-related questions from key stakeholders. This paper will use *story point estimates* for all examples, but the technique in this paper works equally well using other estimation approaches, like *user story counts*.

Once an agile project has begun, a product owner populates the product backlog with ideas for a new or enhanced product. The agile team works together to understand these feature requests. Once understood, the team can use whatever estimation method they choose.

Rather than decomposing all their work up-front, an agile team is content to use rough-order-of-magnitude estimates for their epics. They will only decompose high priority product backlog items on which they expect to work in the next iteration or two. Once they have estimated all the known work in the product backlog (epics and decomposed user stories), they are in position to do release forecasting.

STATISTICAL PERT® NORMAL EDITION

Statistical PERT® Normal Edition is a freely licensed spreadsheet file that uses the built-in statistical functions inside Microsoft Excel®. Statistical PERT spreadsheets are free to download, use, modify, and share with others under the terms of the GNU General Public License, a copyleft license agreement created by the Free Software Foundation (Free Software Foundation, 2007).

Using Statistical PERT—SPERT® for short—an agile team can answer many questions by forecasting answers to them. SPERT does not use Monte Carlo simulation to create forecast results. Instead, SPERT spreadsheets model uncertainties with bell-shaped risk properties using Excel's built-in statistical functions, like the NORM.DIST (normal distribution) and NORM.INV (normal inverse) functions.

WHEN WILL THE PROJECT SCOPE REALLY BE FINISHED?

There are several ways SPERT users can forecast an answer to the question, "When will the project scope *really* be finished?" One way is to use the "Agile Forecast" worksheet (one of several worksheets inside a SPERT workbook). Using this worksheet, an agile team can express a three-point estimate (minimum, most likely, maximum) for how much work they can complete in a sprint or iteration using the team's preferred estimation unit-of-measure.

The unit-of-measure the team uses to estimate items on their product backlog does not matter. The team can estimate using story points, user story count, number of workdays or hours, or some other unit-of-measure to assess the work effort, complexity, and uncertainty represented by their product backlog items.

To create a project finish date forecast, an agile team must know the following:

- The **starting date** for their project (or product release)
- The **number of weeks in their sprint** or iteration planning cycle
- Their **velocity**, which is an average number of what the team can complete in each sprint or iteration planning cycle, expressed using the team's unit-of-measure
- A **subjective judgment** about *how likely* the most likely outcome (that is, their velocity) will occur in future iterations
- A **best-case scenario** for how much the team might possibly achieve in an iteration
- A **worst-case scenario** for how little the team might possibly achieve in an iteration
- The **total amount of work** represented on their product backlog for the whole project or just a subset of features needed for the next major product release

Once these inputs are added to the "Agile Forecast" worksheet, the forecaster can stipulate with what level of confidence they would like to calculate a finish date. Common choices are 10-25% probable to find an aggressive/optimistic finish date, 50% probable to find an expected finish date, and 75-90% probable to find a conservative/pessimistic finish date.

SPERT Normal Edition uses the normal (sometimes called Gaussian) probability distribution to represent the uncertain finish date for a project. Although the normal distribution may not be the best-fitting distribution, using the normal distribution has, in practice, served to fulfill the two main goals of estimating agile project uncertainties: align key stakeholder expectations and make good business decisions earlier.

Since the normal distribution is unbounded (that is, the probability distribution is distributed to infinity on both the left- and right-side of the probability distribution bell-curve, exceeding the boundaries specified by choosing minimum and maximum point-estimates), choosing forecast values should be at least 5% probable and no greater than 95% probable to minimize forecasting distortions from using the normal distribution to model bounded uncertainties.

Below, Figure 1 is an example of the SPERT Normal Edition's "Agile Forecast" worksheet. Using example data, the projected finish date for this project is November 2, 2020. The projected finish date is only 50% probable, meaning, that the true finish date for the project may finish on or before November 2; there is a 50% chance the true finish date will be after November 2.

Statistical PERT® (SPERT®) *Normal Edition* *Agile Forecast*

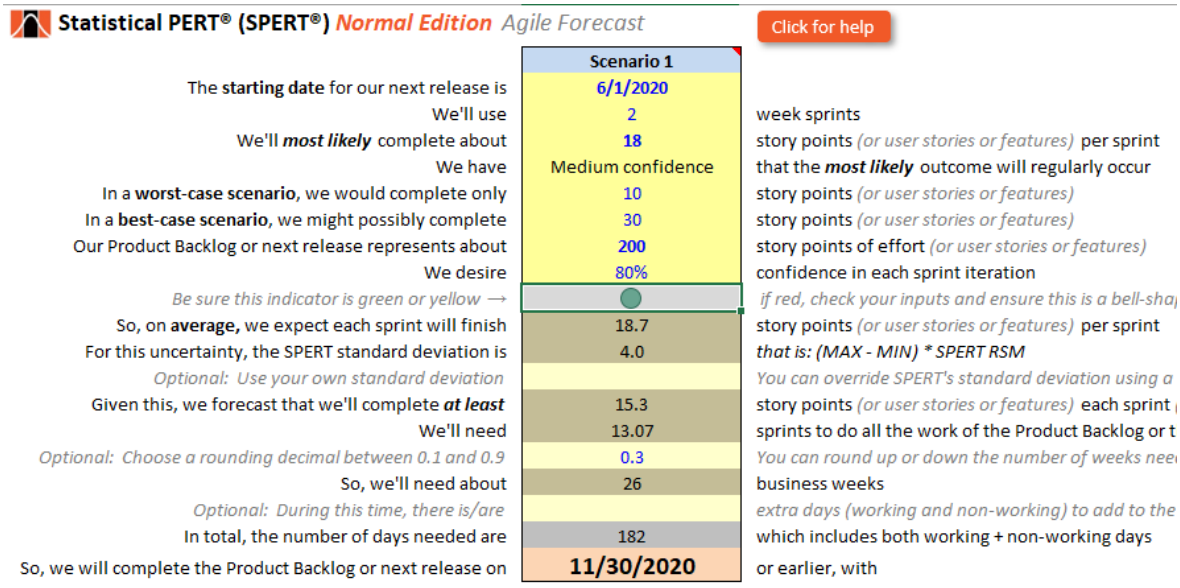
Click for help

	Scenario 1	
The **starting date** for our next release is	6/1/2020	
We'll use	2	week sprints
We'll ***most likely*** complete about	18	story points *(or user stories or features)* per sprint
We have	Medium confidence	that the ***most likely*** outcome will regularly occur
In a **worst-case scenario**, we would complete only	10	story points *(or user stories or features)*
In a **best-case scenario**, we might possibly complete	30	story points *(or user stories or features)*
Our Product Backlog or next release represents about	200	story points of effort *(or user stories or features)*
We desire	50%	confidence in each sprint iteration
Be sure this indicator is green or yellow →		*if red, check your inputs and ensure this is a bell-shaped uncertainty*
So, on **average,** we expect each sprint will finish	18.7	story points *(or user stories or features)* per sprint
For this uncertainty, the SPERT standard deviation is	4.0	*that is: (MAX - MIN) * SPERT RSM*
Optional: Use your own standard deviation		*You can override SPERT's standard deviation using a calculated standard deviation*
Given this, we forecast that we'll complete ***at least***	18.7	story points *(or user stories or features)* each sprint *(for the confidence level expre*
We'll need	10.71	sprints to do all the work of the Product Backlog or the next release
Optional: Choose a rounding decimal between 0.1 and 0.9	0.3	*You can round up or down the number of weeks needed based upon the fractiona*
So, we'll need about	22	business weeks
Optional: During this time, there is/are		*extra days (working and non-working) to add to the date calculation*
In total, the number of days needed are	154	which includes both working + non-working days
So, we will complete the Product Backlog or next release on	11/2/2020	or earlier, with

Figure 1. "SPERT® Normal - Agile Forecast" worksheet at 50% confidence

To find a higher-confidence project finish date, the user needs only to change the percent of confidence to a more desirable choice.

For example, in Figure 2 (below), if the forecaster changes the confidence level from 50% to 80%, the resulting finish date shifts from November 2 to November 30. This makes sense; if an agile team wants to be more certain that they will finish all the work on their product backlog, they will need more time to handle the unexpected issues that may arise during their working together.



Statistical PERT® (SPERT®) *Normal Edition* *Agile Forecast*

Click for help

	Scenario 1	
The **starting date** for our next release is	6/1/2020	
We'll use	2	week sprints
We'll ***most likely*** complete about	18	story points *(or user stories or features)* per sprint
We have	Medium confidence	that the ***most likely*** outcome will regularly occur
In a **worst-case scenario**, we would complete only	10	story points *(or user stories or features)*
In a **best-case scenario**, we might possibly complete	30	story points *(or user stories or features)*
Our Product Backlog or next release represents about	200	story points of effort *(or user stories or features)*
We desire	80%	confidence in each sprint iteration
Be sure this indicator is green or yellow →		*if red, check your inputs and ensure this is a bell-sha*
So, on **average,** we expect each sprint will finish	18.7	story points *(or user stories or features)* per sprint
For this uncertainty, the SPERT standard deviation is	4.0	*that is: (MAX - MIN) * SPERT RSM*
Optional: Use your own standard deviation		*You can override SPERT's standard deviation using a*
Given this, we forecast that we'll complete ***at least***	15.3	story points *(or user stories or features)* each sprint
We'll need	13.07	sprints to do all the work of the Product Backlog or t
Optional: Choose a rounding decimal between 0.1 and 0.9	0.3	*You can round up or down the number of weeks nee*
So, we'll need about	26	business weeks
Optional: During this time, there is/are		*extra days (working and non-working) to add to the*
In total, the number of days needed are	182	which includes both working + non-working days
So, we will complete the Product Backlog or next release on	11/30/2020	or earlier, with

Figure 2. "SPERT® Normal - Agile Forecast" worksheet at 80% Confidence

A key feature from using a SPERT spreadsheet is that the forecaster can apply their own subjective judgment about the uncertainty they are estimating. The "Agile Forecast" worksheet lets the user choose from among 10 different subjective judgments about *how likely* the most likely outcome really is. If an agile team has had difficulty completing their planned work at the end of their iteration time-box, then the forecaster may choose a subjective choice like "Low Confidence" or "Very Low Confidence" that the team will match or come close to matching their historical velocity. Conversely, if the team has established a regular cadence and experiences relatively little variation in what they are able to achieve in each iteration, the forecaster may have "Medium-High Confidence" or "High Confidence" that the team will match or come close to matching their historical velocity.

The forecaster's subjective judgment about *how likely* the most likely outcome really is will change the underlying standard deviation that the SPERT spreadsheet automatically creates to represent the uncertainty's variation. The size of the standard deviation influences the implied shape of the normal distribution bell-curve, and that affects the probabilities associated with the range of possible outcomes.

If a forecaster knows how to calculate the standard deviation from the team's historical velocity (by simply using Excel's STDEV.P function), they can optionally insert the true standard deviation value into this worksheet (row 14) and the explicit standard deviation will override the SPERT-generated standard deviation.

VISUAL FORECASTING USING A PROBABILISTIC BURN-UP CHART

The Statistical PERT® Normal Edition's "Burn-up Chart" worksheet allows a user to explore different what-if scenarios using different inputs assumptions. For an agile team that has actual recorded history of performance, using a burn-up chart can show what happens when future performance mimics past performance. But what happens when past performance is not a good indicator of future performance? What if the team's future performance declines? What if it improves?

Using a probabilistic burn-up chart shows more than just the expected outcome for when the agile team will finish their work. Using Statistical PERT® Normal Edition's "Burn-up Chart" worksheet, an agile team can create a flexible, visual forecast to model a range of future possibilities that might occur. Figure 3 is an example of this burn-up chart.

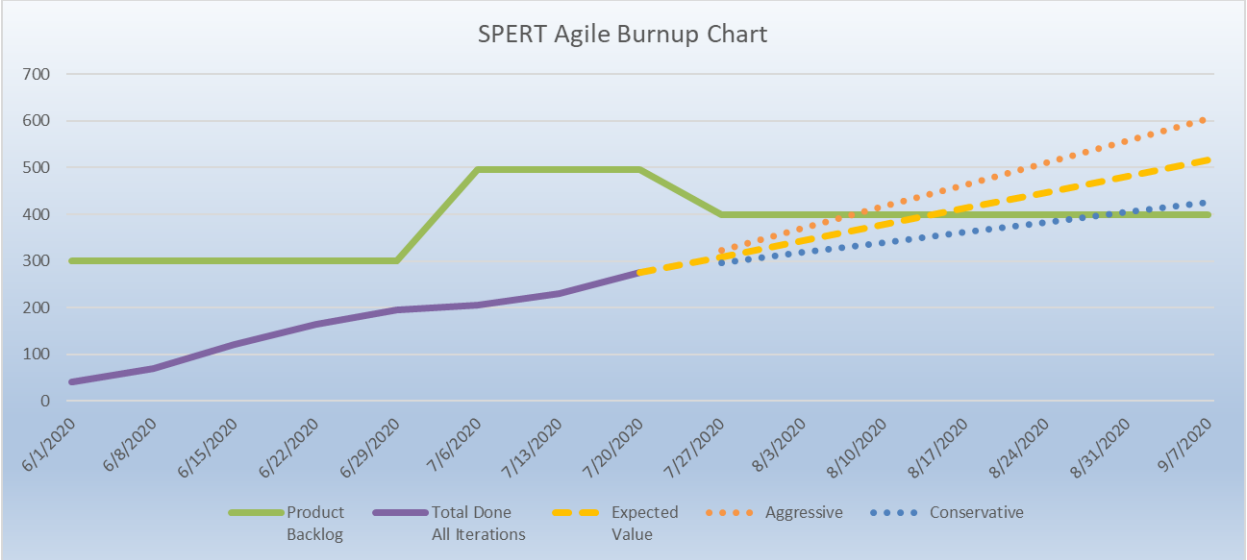


Figure 3. "SPERT® Normal - Burn-up Chart" worksheet

In Figure 3, the horizontal line that begins at Y-axis value of 300 represents the team's estimate to complete a set of work represented on their product backlog. It could be a major product release, a key feature, or even all the work on the product backlog. Beyond completing backlog items, product backlogs change over time—by removing items that the product owner no longer wants and/or by adding new ideas that the team discovers togethers—the horizontal line may rise and/or fall over time. The product backlog line represents a time-series sum of both "done" and "undone" product backlog items.

Examining the calendar date values on the X-axis, the product backlog work was increased between June 29 and July 6 but then decreased slightly between July 20 and July 27. This is normal behavior for product backlog management.

The other solid line—a slightly wavering line rising from the bottom-left corner of the chart—represents the amount of work completed by this agile team. Since this line has not intersected the horizontal line (which represents the product backlog), the inference is that this agile team still has work to complete. Wherever these two solid lines intersect, that is the point that the agile team has completed all the work included in the forecast.

The dashed and two dotted lines on this probabilistic agile burn-up chart constitute the forecast of the agile team's possible future performance. The dashed line is the expected value line; given the team's historical performance as a baseline, the expected value line is the most likely outcome for future performance. Where the dashed line intersects with the product backlog's horizontal line (August 17) is when the agile team most likely will complete all the work included in this forecast. This outcome is a 50/50 forecast. There is a 50% probability that the agile team will finish on or before August 17 and a 50%

probability they will finish after August 17.

The two dotted lines show two other finish date possibilities. One dotted line intersects the product backlog's horizontal line on August 10; this is an aggressive/optimistic possibility which is only 15% probable. The other dotted line intersects the product backlog's horizontal line on August 31; this is a conservative/pessimistic possibility which is 85% probable, meaning that true finish will be on or before August 31 with an 85% likelihood of occurrence. Importantly, the user of a Statistical PERT® spreadsheet can choose any probability values for the aggressive/optimistic and conservative/pessimistic outcomes, and the SPERT® spreadsheet will automatically adjust the burn-up chart accordingly.

With a probabilistic burn-up chart, agile teams can align with key stakeholders on the range of possible and probable outcomes for when they will finish a defined set of work on the product backlog. If key stakeholders do not like what they see in this visual forecast, they and the agile team can work together to find ways to improve the forecast. For instance, the team might need to remove items on the product backlog, de-scope items that stay on the product backlog, add additional team members, or find other, simpler ways to fulfill items that stay on the product backlog.

To create the probabilistic forecast, the forecaster will interact with a table that is on the SPERT "Burn-up Chart" worksheet (Table 1):

Statistical PERT® (SPERT®) *Normal Edition* *Agile Burnup Chart*

ID	Iteration (Sprint) Finish Dates	Product Backlog	Actual "Done" This Iteration	Total "Done" All Iterations	Prod. Backlog: All To-Do + Total "Done"	Expected Value	Aggressive 15.0% 47.2	Conservative 85.0% 21.6
1	6/1/2020	300	40	40	300			
2	6/8/2020	260	30	70	300			
3	6/15/2020	230	50	120	300		#N/A	#N/A
4	6/22/2020	180	45	165	300		#N/A	#N/A
5	6/29/2020	135	30	195	300		#N/A	#N/A
6	7/6/2020	300	10	205	495		#N/A	#N/A
7	7/13/2020	290	25	230	495		#N/A	#N/A
8	7/20/2020	265	45	275	495	275	#N/A	#N/A
9	7/27/2020	125			400	309	322	297
10	8/3/2020	125			400	344	369	318
11	8/10/2020	125			400	378	417	340
12	8/17/2020	125			400	413	464	361
13	8/24/2020	125			400	447	511	383
14	8/31/2020	125			400	481	558	404
15	9/7/2020	125			400	516	605	426
16								

Table 1. Input table on the "SPERT® Normal - Burn-up Chart" worksheet

The burn-up table requires these inputs:

- **Iteration (Sprint) Finish Dates**: *The finish dates for future iterations/sprints*
- **Product Backlog**: *The current work represented on the product backlog that is within the scope of this forecast*
- **Actual "Done" This Iteration**: *When known, this is a count of actual "Done" work for each iteration, summing product backlog item estimates for "Done" work*

In Table 1, the current sprint has a finish date of July 27, and there are 125 story points of

work left to do. Importantly, to correctly represent future work on the burn-up chart, the current work left to do in the "Product Backlog" column must be copied downward until the last iteration finish date entered under the "Iteration (Sprint) Finish Dates" column.

Notice the two cells below the labels "**Aggressive**" and "**Conservative**" (top-right corner in Table 1). These are user-enterable probabilities that correspond to the meaning of an aggressive/optimistic finish date or a conservative/pessimistic finish date. By default, they are set at 15% and 85% respectively, but the SPERT forecaster can change these values.

As each iteration completes, the forecaster will enter the sum of estimates for completed product backlog items into Table 1 (under the column heading, "Actual Done This Iteration"). The burn-up chart will update automatically to reflect all completed work, and the forecast of how the agile team might perform in the future will also be updated. Naturally, as the team gets closer to completing all their work, the gap between the "Aggressive" and "Conservative" forecast lines (where they intersect with the "Product backlog" line) will grow narrower as these possibilities converge with the "Expected Value" forecast line because there is less uncertainty about the imminent future.

CONCLUSION

Forecasting is superior to single-outcome estimates. Forecasting shows both the range of possibilities and the probabilities of those possibilities. Forecasting aligns agile teams, organizational leaders, and other key stakeholders by making explicit what the team believes is feasible and infeasible and what their sense of certainty is with respect to their effort in converting product backlog items into working software.

By using Statistical PERT Normal Edition's "Agile Forecast" and "Burnup Chart" worksheets, agile teams can model their planned development efforts and quantitatively answer common questions that organizational leaders have about when new features will be available for deployment or when the project's original scope will be delivered.

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INTRODUCTION TO EARNED VALUE: A CASE STUDY

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ABSTRACT

Earned value is an approach to track the value of a project's product as it relates to planned and actual spending. This session will introduce the audience to basic earned value concepts and how to use these concepts to forecast and report project costs. The material presented follows the foundation provided in the *Project Management Body of Knowledge (PMBOK® Guide)* established by the Project Management Institute (PMI®). We will follow a case study to demonstrated the concepts, challenge the audience and forecast estimate at completion.

INTRODUCTION TO EARNED VALUE: A CASE STUDY

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Earned Value is like the ghost that you can't see but everyone tells you exists. You know it's out there but don't truly understand what it does and why we as project managers need it.

Simply put, earned value is a comparison of what we planned to spend, what we actually spent, and the value of the project's product at any given point of time. We can then take that input to perform a cost and schedule analysis to determine project status. Using this data combined with a thorough understanding of our project's situation, we can forecast the completion cost of our project.

For example, consider Figure 1 below. This project is to build two military tanks. Each tank will cost $1M for a total Budget at Completion (BAC) of $2M. I know, not very realistic costs but the math works.

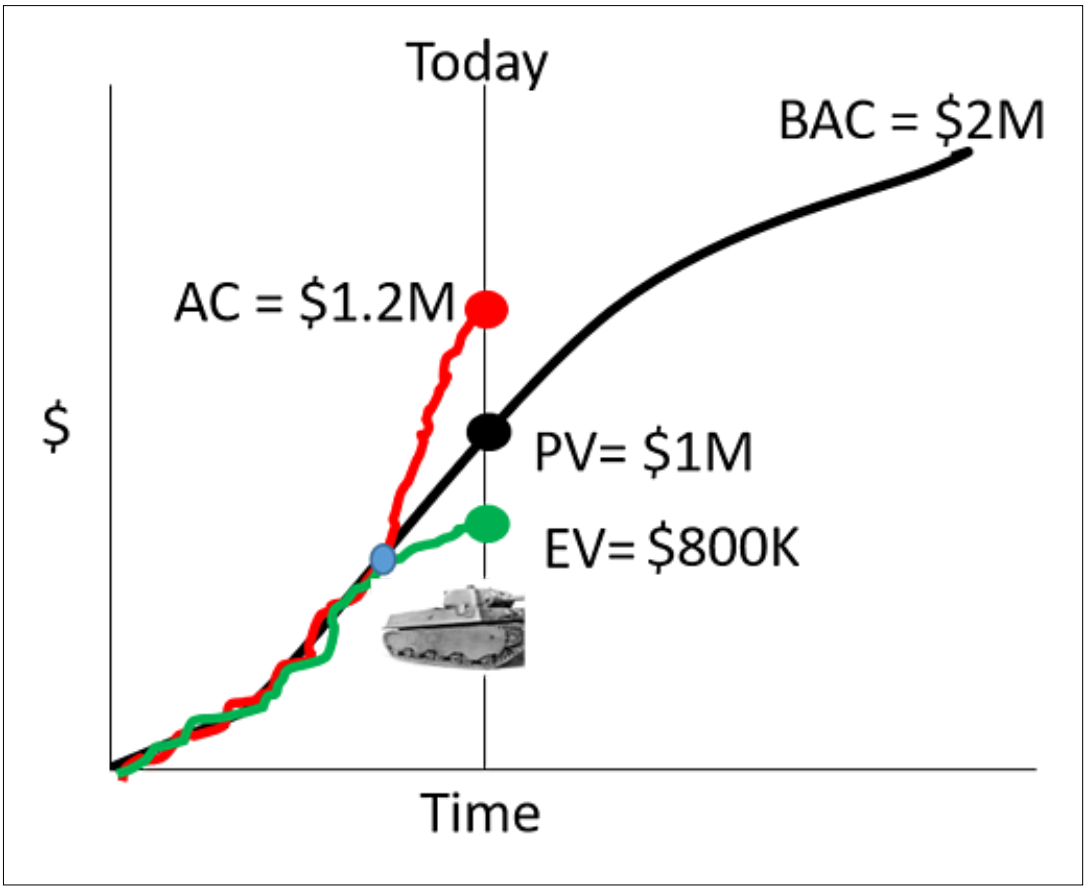

Figure 1: Earned Value Analysis

Following the diagram above, the project manager must report that the team had planned to spend $1M and deliver one tank, but has actually spent $1.2M to deliver 80% or $800K worth of the first tank. This $800K is called Earned Value. Clearly this is not good news and, utilizing some simple formulas, we can calculate just how bad.

- **Cost performance** can be calculated using **Cost Variance (CV)** which is a comparison of the earned value of tank one against the actual cost to-date to deliver that value. CV = EV-AC or ($400K). My project is $400K over budget. We can convert that variance into an index by calculating the **Cost Performance Index (CPI)**: EV/AC or $.66. The CPI states that the project is spending at a $.66 efficiency against the dollar. Not Good!

- **Schedule performance** can be calculated using **Schedule Variance (SV)** which is a comparison of the earned value of tank one against what it was planned to be worth as of today. SV = EV-PV or ($200K). This project is behind schedule because tank one was planned to be complete and worth $1M but it's actually incomplete and worth $800K. We can convert this variance into an index by calculating **Schedule Performance Index (SPI)**: EV/PV or $.80. The SPI states that my project team is delivering $.80 worth of tank for every $1 dollar **we had planned** for them to spend. Again, Not Good.

When I teach this in our *Earned Value* Course or our *PMP® Exam Prep*. course, the first question I'm always asked is "why is the tank worth $800,000 when it doesn't function?" Good question! The military officer who is sponsoring your construction effort would certainly agree that the tank is worthless until it's complete. Addressing and assigning percent complete on any project product must be decided before the project begins and documented in the Cost Management Plan. There are many approaches that can be used to accomplish this.

- Firm fixed price contracts will often assign earned value upon the completion of project phases and acceptance of the deliverable at the end of that phase. This is called the "weighted milestone method". For example, if the Design Phase of a project makes up 25% of the project's work, the project will be awarded the dollar equivalent of 25% of the BAC. At that time a cost and schedule analysis can be done by calculating the actual cost and planned value.

- For cost reimbursable and time and materials contracts when more services and less products are being delivered and a detailed project schedule exists, earned value can be calculated for each activity on the project schedule. This is called the "fixed formula method". For example, if we are using the 50:50 formula, 50% of the value of an activity is earned the second that activity starts but the remaining value cannot be earned until the activity completes. This is great news when the activity starts, bad news when the activity is >50% complete and not yet completed, and great news again once the activity is completed on time.

- The "percent complete" method is used when the sponsor can look at the project's product and fairly easily measure completion. This works well in construction when one can look at the building and using their experience, understand the project's completion and the subsequent earned value.

As you can see, measuring value is not an exact science but it does bring us closer to calculating some value at any given point in the project.

Let's get back to our tank that is 80% complete and overbudget and behind schedule. The project manager needs to be able to answer some questions such as:

- What happened here?
- Can you complete this on time?
- Can you complete this for $2M?
- Are you asking for more money? If so, how much?

The answers to these questions are heavily dependent upon what occurred on the project. First note the blue dot on the graph. The project's performance up until that blue dot was stellar, on schedule and on budget. Something happened at that blue dot to cause the project to overspend and under-deliver. Let's examine the possible causes and use that information to re-calculate the project's BAC. We call that re-calculation the Estimate at Completion.

1. The senior technical lead was pulled off the project temporarily to work on a proposal at headquarters. The resource manager sent you two lesser skilled technical resources who were not as productive and added costs to your project. Once your technical lead returns, those unproductive resources are taken off the project. This is called an anomaly and when it occurs we can re-calculate the BAC using the formula AC (actual costs) + (BAC-EV). Your revised BAC, or EAC is now $2.4M and you will need to seek approval for an additional $400K. I don't think your sponsor will empathize with you so don't expect approval for additional funding.

2. The vendor supplying materials offered some special bulk ordering pricing which you just couldn't refuse. Thus, you didn't follow your original spend plan and your team was forced to deviate from the development to store all of the parts you purchased for both tanks. You simply need to re-plan the remaining work and assuming no additional development time is needed, you should be able to communicate that no additional funds will be needed, BAC=EAC.

3. Starting at the blue dot, the cost of steel went up because of trade tariffs. Materials pricing will not come down for your project, so you are stuck with purchasing steel at a higher price then originally planned. Under this circumstance you can use the formula BAC/CPI to calculate the Estimate at Completion which will be $2.9M. This change request of $900K should be approved unless you are delivering under a firm fixed price contract and then some negotiations will be needed.

4. The last scenario is that spending and productivity will continue on its present path. This is bad news and you may want to start writing your resume. Under this circumstance you can use the formula:

$$AC + \frac{BAC-EV)}{CPI*SPI}$$

   Your $2M project is now estimated to cost $3.4M! This can be caused by many things including unmanaged scope (scope creep), unanticipated materials costs, unqualified resources, etc.

In summary, projects go bad for many reasons. As project managers, some of these issues we can control and others we cannot. Having the capability, knowledge and experience to communicate these metrics will give you and your sponsors the information they need to make informed choices, manage impact and control projects.

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Operationalizing resilience for Srinagar Smart City

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ABSTRACT

Smart City Mission was launched by the Government of India in 2015, aims to develop 100 smart cities across India. The primary objective of the program is to transform existing cities into smart cities by incorporating urban renewal and redevelopment, both brownfield and greenfield and retrofitting thereby making the cities smart, sustainable and citizen friendly. The secondary objective of this program is to foster economic growth through these smart cities, which in turn will have a "rub-off effect" on neighboring cities and towns. India is vulnerable to several types of disasters – natural and man-made and such a large-scale program of urban renewal and redevelopment could have been useful in make a selected few cities disaster resilient. However, the Smart City Mission loses out on an opportunity to incorporate resilience in the newly developed smart cities.

The focus of this study is the city of Srinagar in North India, which is currently being developed as one of the Smart Cities in India. Srinagar is one of the most disaster-prone cities in India. The city has developed a detailed system with several layers of policies and procedures for disaster management, but that system is majorly reactive in approach and does not emphasize on resilience. Though several frameworks exist for incorporating resilience at a city level, there are none for operationalizing resilience at a city level. To overcome this research gap, a detailed study was carried out in association with experts related to disaster management and allied fields to develop a stage-wise holistic resilience maturity model. Though cities face unique disasters, due to their geographies, complexities, urbanization and culture, this Resilience Maturity Model can be adopted by any city of the world.

INTRODUCTION

Srinagar, the winter capital of the state of Jammu and Kashmir has witnessed unprecedented levels of unplanned urbanization over the past few decades. The population has increased from 2.85 lakhs in 1961 to 4.57 lakhs in 1971, 6.06 lakhs in 1981, 11.10 lakhs in 2001 to 20.84 lakhs in 2011. (Nengroo, et al., 2017). Same is the case with rest of India where the urban population has seen an increase of around 4% from 2001 to 2011 and is projected that 40% of total Indian population will be residing in urban areas by 2030, and nearly 50% by 2050. (Census of India, 2011). Globally as well, the trend of urbanization continues at a steady rate.

In general, urbanization does not pose any threat to the environment or development, however, access to several basic amenities is restricted by unplanned urbanization.

(Nengroo, et al., 2017). Further, if the urbanization is at a rapid rate it may lead several other issues like lack of suitable dwelling units, slums, overburdened transportation system, pollution, environmental degradation and an overall burden on the existing infrastructure. (Aijaz & Hoelscher, 2015). In India, due to the lack of strict regulations and planning cities have seems unorganized and unplanned growth. There is a large-scale migration across the country from rural to urban areas, as urban areas provide better employment opportunities and better quality of life. It is estimated that around 30% of the Indian population now live in urban areas as compared to around 18% in 1960 (World Bank, 2020). This constant, rapid and unregulated urbanization has led to the overburdening of existing city infrastructure. (Bashir, 2020) which is an underlying cause of low FDI (foreign direct investment) in India (Aijaz & Hoelscher, 2015).

NATIONAL SMART CITY MISSION IN INDIA

The National Smart City Mission launched by the Government of India in 2015 as an urban renewal program to make existing cities citizen-friendly and sustainable. It emphasized on development of core infrastructure; technological interventions and area-based development. The basic objective of this program is to drive economic growth in the 100 selected Smart city which other cities can emulate. (Praharaj & Han, 2019) (Gupta & Hall, 2017) (Smart Cities Mission, 2015).

SRINAGAR – INTRODUCTION

Srinagar is the capital and the largest city of the state (now Union territory) of Jammu and Kashmir, the northern state of India. It is located at the foothills of the Himalayas at an elevation of 1585 meters from sea level. The city is located on both the banks of river Jhelum, which divides the city into two parts and is connected by 9 bridges. The total area of the city is around 294 square kilometers.

The city is growing rapidly amongst all Himalayan cities (Bhat, 2008) and is currently ranked at 92nd based on the annual growth rate for a period from 2006 to 2020 (City Mayors, 2006). The population of the city stands at 1,180,570 as per 2011 census (Census of India, 2011). The density of population is around 4000 per square kilometer (10000 per square mile). The average temperature varies from 23.3 C during summers to 3.2 C in winters. The city has several water bodies and wetlands.

SRINAGAR SMART CITY

Srinagar is one of the Smart Cities being developed under the Smart City Mission of the Government of India. Srinagar Smart City project was approved in Round 3 of the Smart City challenge held in April 2017. Srinagar Smart City “aspires to leverage its Natural & Cultural heritage/ tourism, through innovative and inclusive solutions, enhance the quality of life for its citizens”.

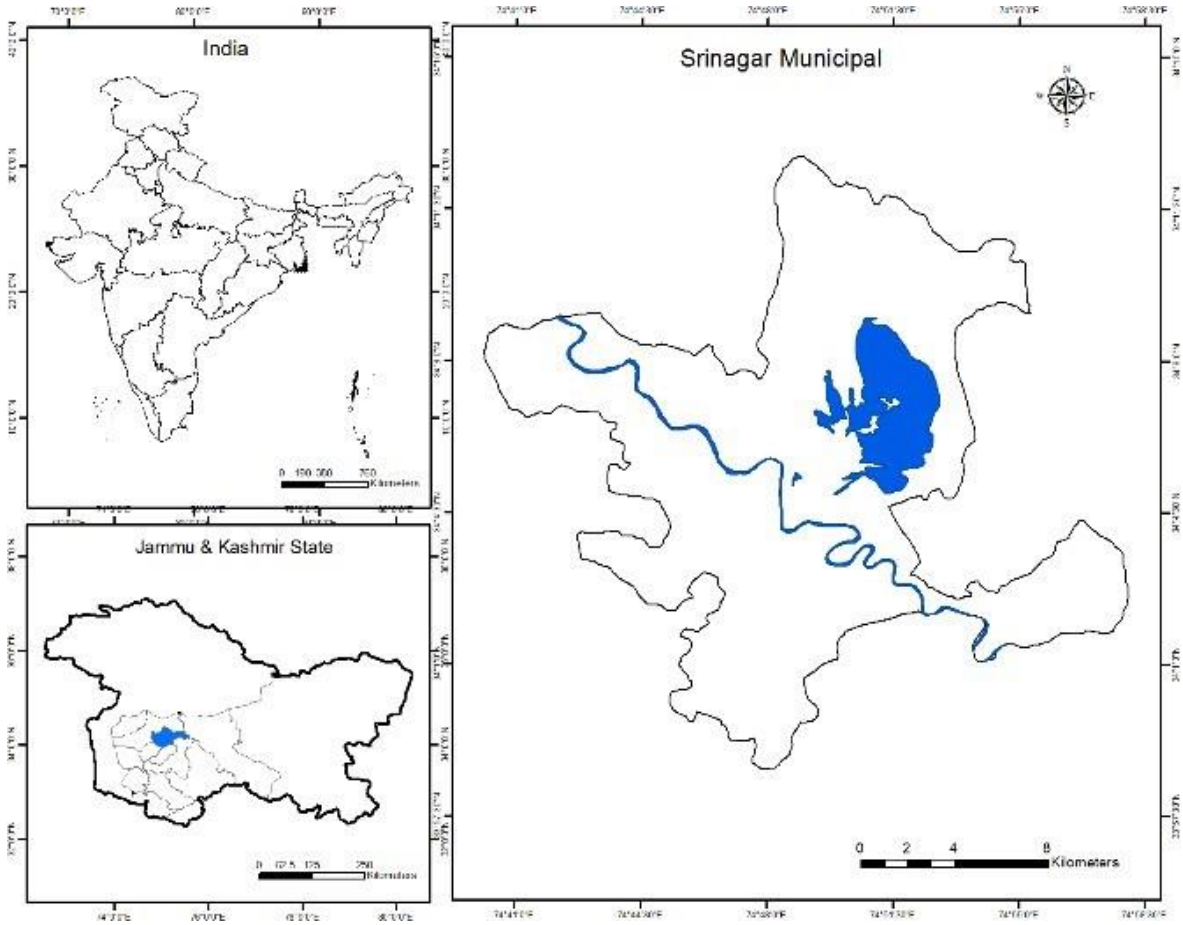

Figure 1: Location of Srinagar City (Ahmad, et al., 2017)

DISASTERS IN INDIAN CONTEXT

The vast and varied geographical expanse, geology, climatic conditions, demographic divide, socio-economic conditions and rapid urbanization makes India vulnerable to multiple disasters. These pose a great risk to the economy, population and development of the country (Bashir, 2020). More than half of the total geographical area falls under the "moderate" to "severe intensity" zone of earthquakes. Around 20% of the area is prone to drought and 12% is prone to floods. India has a long coastline of more than 7500 km which is vulnerable to tsunamis and cyclones. The mountainous region, Himalayan and sub-Himalayan ranges are prone to snowstorms, avalanches and landslides. (Metri, 2006) (NDMA, 2020).

Apart from natural disasters, India is also prone to manmade disaster like chemical, biological, radiological and nuclear proliferation. (NDMA, 2020). Further, it is also vulnerable to health epidemics, political turmoil and terrorism due to the country's varied nature. (Bashir, 2020)

LITERATURE REVIEW

URBAN AREAS AND DISASTERS

Urban areas or cities are seen from the view of a rural-urban continuum in disaster management research. This continuum includes villages or the rural countryside, towns or semi urbanized villages, cities and adjoining satellite cities or towns, metros and megapolis. Urban disasters are limited to the urban context. (Wamsler, 2014). A high density of population is one of the main characteristics of an urban area, this is often the main reason for increasing the disasters manifolds. (Malalgoda, et al., 2013). A disaster can be defined as an unprecedented and sudden disruption (either short or long term) which results in fatality, economic or environmental loss. (Bashir, 2020)

With cities growing larger and larger, the disasters have also been increasing in magnitude and intensity in the urban areas. Research also suggests that urban disasters are increasing in both in the terms of occurrences and human and economic losses. (Wamsler, 2014). This is true in Indian cities as well, the magnitude of disasters is increasing in terms of losses and can be attributed to the changing built environment of the ever-growing cities.

RESILIENCE AND URBAN STRESSORS

Resilience is often defined in terms of the system's ability to resist and function optimally during the period of stresses and threats (Satterthwaite, 2013) and how the system recovers as well (Baum, 2015). The ability to resist, for a city depends significantly on its built environment. A resilient built environment provides safety and protection to the city's physical and social environment (Haigh & Amaratunga, 2011). Using a holistic approach of understanding the strengths, weaknesses, threats, risks, linkages, stressors and relievers to make the city be able to better cope up with disasters. This leads to minimizing losses – loss of life, property, environment and economy and helps the city to return to the state before the disaster quickly and ensuring socio-economic wellbeing. (Hernantes, et al., 2019) (Spaans & Waterhout, 2017) (Bashir, 2020). The World Bank has developed the Resilient City's Program intending to incorporate resilience in the cities around the world. The vulnerabilities are categorized into five broad groups – Climate, Environment, Resources, Infrastructure and Resources. To overcome these vulnerabilities the cities, need to develop five broad groups – Governance, Institutions, Technical Capacities, Funding structures and Planning systems. (Global Facility for Disaster Risk Reduction, 2015). For a holistic resilience to be developed for a city, it needs to be at three levels – Individual level, household level and at the community level. (Satterthwaite, 2013)

From the urban planning view, a city can be termed as resilient if it can cope and respond to changes during a disaster without much loss in functionality (Tompkins & Hurlston-McKenzie, 2011). A resilient city needs to demonstrate resilience against four categories of stressors – Natural, Economic, Technological and Man-made. Natural stressors are usually unpredictable and uncontrollable. These include but not limited to earthquakes, landslides, floods, droughts, cyclones, tornadoes. A city typically has little or no control over these natural stressors. Natural stressors are majorly external barring famines or droughts, which may not be truly external. Other three stressors – Economic, Technological and Man-made are internal and the city has a certain extent of control over these internal stressors (Desouza & Flanery, 2013). However, the control may not be absolute and may vary from city to city depending on several factors – unplanned

development, growth of population, level of urbanization and dearth of resources. The systems of a city are under a lot of stress due to the combining effect of these factors and the four stressors. This combining effect extrapolates the magnitude and intensity of disasters in urban areas. (Bashir, 2020).

RESILIENCE AND QUALITY

The overall quality of the built environment is one of the main factors which determines the overall resilience of a city. Well-designed cities with good construction are more resilient to disasters and have a greater chance of recovering from a disaster in a short span of as opposed to a city with poorly designed and constructed built environment. The poorly designed and constructed built environment, in some cases, increases the magnitude of the disaster or may give rise to interdependent or secondary risks (Bosher, 2008). Even cities with the well-built and resilient built environment may have areas where the infrastructure is poorly designed and constructed. These areas suffer the most during the disaster (Satterthwaite, 2013). The quality of life in the urban area is dependent on the built environment of the city. It is essential to incorporate resilience in the systems of the city so that it not only copes and adapts to any disruption in a way that it remains functional at a certain level during the disaster and its built environment remains intact (Malalgoda, et al., 2016). Critical Infrastructure that is deemed necessary for the built environment of the city must remain functional at an optimal level during the disaster. Therefore, it is necessary to "design, develop and manage resilience" the critical infrastructure in the built environment of the city (Haigh & Amaratunga, 2011). Additionally, given the unique nature of the cities in terms of the built environment, it is essential to consider city-specific needs while designing resilient solutions for the city (Satterthwaite, 2013) which may include re-engineering the infrastructure to make it more resilient so that it can cope any disaster (Malalgoda, et al., 2016)

DISASTER RISK REDUCTION IN INDIAN SMART CITIES

The Smart City Mission launched by the Government of India in 2015 is a program of urban renewal and redevelopment of existing cities to transform them into smart cities. It had given a chance for the cities to incorporate resilience in developing the smart cities. However, examining the Smart City Proposals (SCP) of the cities submitted for the Smart City Mission it is observed that only 30% of the cities have incorporated resilience in some form but there is a lack of implementing holistic resilience in the proposals (Bhatnagar, et al., 2018). The Indian cities are some of the most densely populated cities in the world and are facing several stressors which have put a lot of stress on the already existing infrastructures of these cities.

DISASTERS IN SRINAGAR CITY

The city, in the past few decades, has faced a spate of earthquakes, landslides and floods, terrorism and is prone to multiple disasters. The recent floods in 2014 resulted in the death of around 277 people and estimated property damage of around 5 billion rupees (Mishra, 2015). The highest flood depth was around 32 meters. (Kumar & Acharya, 2015). Srinagar falls under Zone V or "very severe intensity zone" of earthquake zoning in India. Earthquakes occur frequently and are mostly of high intensity. The earthquake of 2005

measured 7.6 on the Richter scale was one of the very severe intensity earthquakes to hit the region. Nearly 90000 people lost their lives and around 100000 injured (USAID, 2006). Given the topography of the city, it is vulnerable to landslides and mudslides. Apart from natural disasters, the city is vulnerable to man-made disasters as well. The precarious political situation has given rise to terrorism and violence due to which many people have lost their lives.

RESEARCH METHODOLOGY

The study uses a mixed research method with both qualitative and quantitative research techniques using research tools such as co-word analysis, semi-structured interviews and Delphi technique. Since developing a model for resilience building requires holistic participation of various stakeholders with different perspectives. Also, it is necessary to know about the interdependencies amongst sectors and services to have coherence in policies and plans (Desouza & Flanery, 2013).

The Risk Maturity Model presented in this study was developed in collaboration with multidisciplinary expert's form district administration, State disaster management authority, State police, state fire and emergency services and the Smart City Limited. These experts were a part of the pilot interview, Delphi technique and semi-structured interview.

Table 1: Brief profile of the experts consulted in the study

	Organization	District Administration	State Disaster Authority	Police	Fire and Emergency Services	National Disaster Relief Force	Smart City Limited
Experience (years)	0 to 5	3	x	x	x	x	1
	6 to 10	2	1	x	1	1	x
	11 to 15	1	x	3	1	x	x
	15+	x	1	x	x	x	x
Total no. of experts		3	2	3	2	1	1

MAPPING WITH RESILIENCE FRAMEWORKS

The Srinagar Smart City Proposal (SCP) was mapped against two established resilience frameworks to establish a benchmark. The Sendai Framework for Disaster Reduction (2015-30) was adopted by the United Nations in 2015 as a non-binding, voluntary agreement that allows member nations to reduce disaster risk (Bashir, 2020). It comprises of seven specific targets and four areas of priority. (UNISDR, 2015)

The Rockefeller Foundation's 100 Resilient Cities (100RC) aims to establish a hundred resilient cities around the world. Applications were invited in 2013, 2014 and 2016. The City Resilience Framework developed by the 100RC, includes four priority areas, with each priority, having three drivers (100 Resilient Cities, 2015)

The two frameworks were adopted before the SCP was prepared. The criteria of both the framework were analysed and mapped against the Smart City proposal (SCP) submitted

to the Smart City Mission Challenge by using text analysis method. Further, a pilot interview was conducted with experts from the smart city project to establish the correctness of the mapping.

Table 2: Mapping against Sendai Framework

		Srinagar Smart City Proposal
Sendai Framework (2015)	Understanding disaster risk	Yes
	Strengthening disaster risk governance	No
	Investing in disaster risk reduction for resilience	No
	Enhancing preparedness for effective response	Yes
	Effective recovery, rehabilitation and reconstruction"	Yes

Table 3: Mapping against 100 RC Framework

		Srinagar Smart City Proposal
100 Resilient Cities (2015)	Provide reliable communication and mobility"	No
	Provide and enhance natural and manmade assets	No
	Foster long term and integrated planning"	Yes
	Promote leadership and effective management	No
	Meet basic needs"	Yes
	Ensure public health services	No
	Ensure social stability, security and justice"	No
	Support livelihoods and employment	No
	Promote cohesive and engaged communities"	No
	Foster economic prosperity	No
	Ensure continuity of critical services"	Yes
	Empower a broad range of stakeholders	No

DEVELOPMENT OF A RESILIENCE MATURITY MODEL

A maturity model is a hierarchical description of progress in various stages of maturity (Wendler, 2012). The main use of a maturity model is to define the level of maturity using multi-dimensional criteria which are used to derive action areas according to priority and areas for improvement (Fleming, 2001) (Becker, et al., 2009) (Wendler, 2012)

Using different incremental maturity levels of resilience, the maturity model was modified to depict different stages of incorporating resilience in the smart city. (Bashir, 2020). Using progressive and systematic increments a Risk Maturity Model can be used to develop incremental resilience in a city. (Hernantes, et al., 2019). Resilience Maturity Model (RMM) used in this study used two parameters of judging resilience – likelihood of recovery and Recovery readiness.

The stages of the Resilience Maturity Model are depicted below:

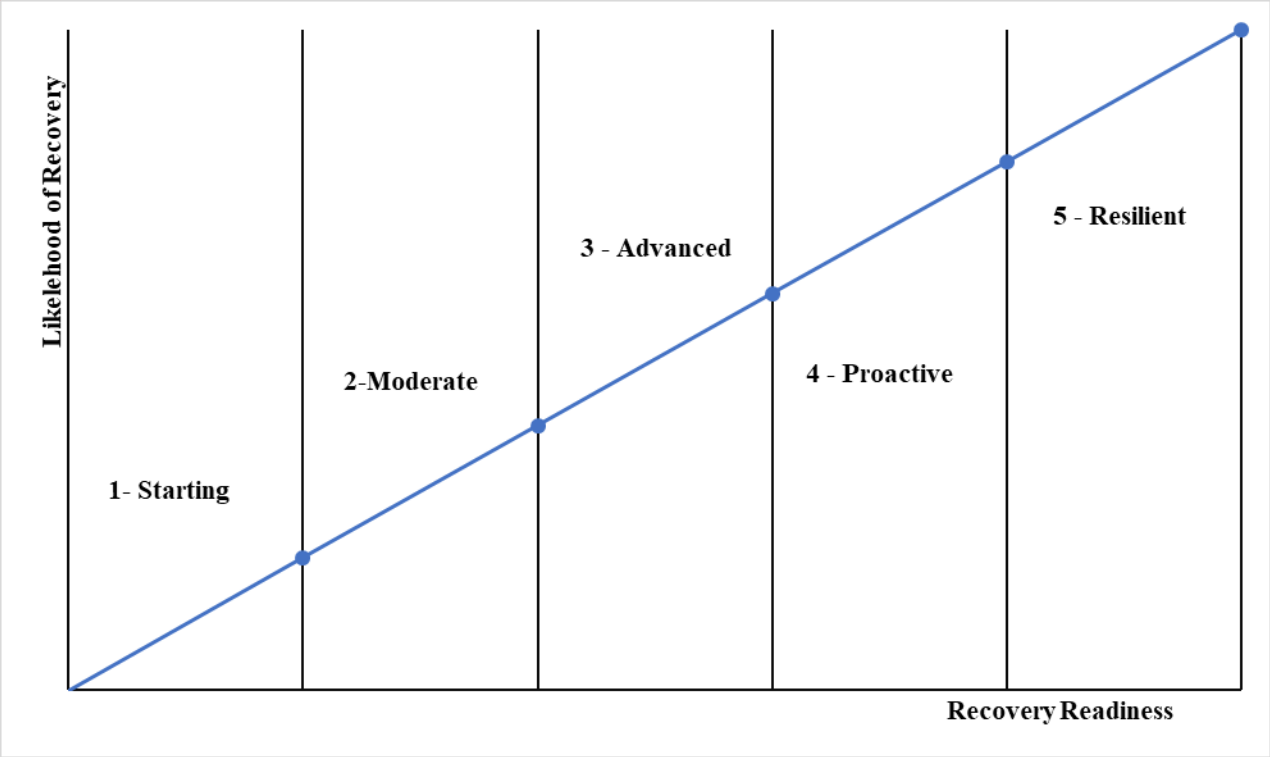

Figure 1: Five-Stage Resilience Maturity Model (RMM)

The maturity levels are defined below:

STARTING

This is the stage-I of RMM and there is no approach to incorporate resilience. There is very little or no understanding of disaster and disaster management. There is no clear policies or procedures exist for disaster management. The disaster management plan may exist in a fragmented form and there is no chance that it may be useful to deal with the disasters – unknown, unexpected or multiple disasters. There is no collaboration between the institutions and the city lacks the technical capability to deal with any disaster.

MODERATE

This is the second stage of the RMM and there are some regulations and standards which are developed to deal with disasters. Disaster Management plans exist and there is some coordination between different institutions and there is an emphasis on increasing awareness through education and training. There is a general understanding of the role of critical infrastructure during disasters.

ADVANCED

The planning systems are much advanced backed by policies, laws and regulations, standards with dedicated elements of disaster management. Greater emphasis on spreading awareness in the community and involvement of academia in the development of techniques for reducing disaster risk. The role critical infrastructure is well understood, and measures are taken to improve the reliability of the critical infrastructure during disasters. Their involvement of stakeholders is only limited to the planning stage.

PROACTIVE

This is the fourth stage of RMM, the disaster management plans are fully developed, and integrated, other policies, procedures, laws and regulations are also well developed, and the institutions of the city are actively collaborating and are proactive in approach. The community is well informed and actively participates in mock drill and training conducted by a group of volunteers. The stakeholders work together on the same platform have a full understanding of developing resilience.

RESILIENT

The city can withstand any disaster – expected, unexpected or multiple and can bounce back to its original state without much delay. The city can optimally function during the disaster due to its reliable critical infrastructure. All stakeholder work on the same platform and are engaged.

ADOPTION OF SMR AND RESILIENT CITY FRAMEWORKS

This study adopted the SMR framework (Smart Mature Resilience, 2016) for operationalizing resilience. The SMR framework is developed for European cities and was modified in collaboration with experts to be adopted for Srinagar Smart City keeping in view the unique features of the city intact. Using the Delphi technique, the dimensions of SMR framework were analyzed and using the opinion of expert it was combined with the Resilient City's Program of World Bank to develop a holistic framework for operationalizing resilience.

The World Bank has developed the Resilient City's Program intending to incorporate resilience in the cities around the world. The vulnerabilities are categorized into five broad groups – Climate, Environment, Resources, Infrastructure and Resources. To overcome these vulnerabilities the cities, need to develop five broad groups – Governance, Institutions, Technical Capacities, Funding structures and Planning systems. (Global Facility for Disaster Risk Reduction, 2015).

CONCLUSION

Cities around the world, especially in developing countries are under a lot of pressure due to unplanned and rapid urbanization. This is problematic when these cities face disasters. The cities ability to cope with disasters is limited due to rapid unplanned urbanization. Indian cities are currently undergoing redevelopment under the Smart Cities Mission and it provides an opportunity to make the cities resilient.

Srinagar city is vulnerable to multiple disasters and there is a need to incorporate resilience. There is an already existing system for Disaster Management in the city, however it is reactive in nature. There is no provision of incorporating resilience in the city. As Srinagar is being developed as a Smart City, it gives the city administration to incorporate resilience in the new developments. However, there is a need to not only incorporate resilience in the city systems but also to operationalize resilience. Though there are several frameworks available for incorporating resilience at a city level, there is a lack of any established study for operationalizing resilience. This study focusses on the development of a holistic stage-wise framework for operationalizing resilience.

Table 4: Detailed Five stage Resilience Maturity Model (RMM)

		Maturity levels				
Dimensions	Subdimensions	Starting	Moderate	Advanced	Proactive	Resilient
Leadership and Governance	Development and enhancement of laws and regulations (G1)		Develop a white paper about the governance approach at multiple levels (GM1)	Develop policies and procedures conforming to National level (GA1)	Develop policies and procedures conforming to International level (GP1)	Establish SOP's and standards for incorporating resilience (GR1)
Institution	Smart City Authority Ltd. (I1)	Develop a dedicated team for looking at resilience in the city (I1S1) Incorporate resilience in the mission and vision of the Smart City Proposals and other documentations (I1S2)	Setup a resilience department with cross-functional sub-departments (I1M1) Map the resilience plan with those other cities (I1M2) Promote equality in access to all sections of the society (I1M3)	Develop a plan to integrate cross-functional city departments like municipality, fire department, district administration (I1A1)	Map the resilience action plan with state-level agencies like State Disaster Relief Force and other institutions (I1P1)	Map the resilience action plan with national-level agencies like National Disaster Relief Force and other institutions (I1R1)

Planning Systems	Education and Training (P1)	Conduct training with city level emergency team (P1S1) Develop a group of volunteer citizen group to be deployed during a disaster (P1S2)	Conduct regular mock drills and training for emergency teams and volunteers P1M1)	Conduct mock drills and training for emergency teams and volunteers (P1A1) Audit and modify the training programs as required (P1A2) Conduct Regular educational and training programmes at schools and colleges (P1A3)	Conduct regular mock drills and training across various city authorities, emergency services and educational institutes (P1P1) Develop training with other cities (P1P2)	Develop and conduct regular training and mock drills for all sections of the society (P1R1)
	Resilience action plan development (P2)	Identify the requirements for city-level resilience (P2S1)	Formulate a plan for incorporating resilience (P2M1)	Establish indicators for the assessment of resilience plan performance (P2A1)	Assess and monitor the efficacy of the resilience plan (P2P1)	Revise and redevelop the resilience plan and monitor the performance regularly (P2R1)

Technical capacity	Reliability of infrastructures (T1)	Develop a plan to assess the reliability of critical infrastructure(T1S1)	Develop a plan to enhance the reliability of critical infrastructure (T1M1)	Develop a contingency plan for failures (T1A1)	Develop a plan for regular audit of critical infrastructures (T1P1)	Emphasize on continuous improvement of the critical infrastructure (T1R1)
	Development of partnerships with city stakeholders (T2)	Map relevant stakeholders to develop a resilience plan (T2S1) Develop a mechanism to make emergency information public ally available (T2S2)	Develop a stakeholder engagement plan defining its roles and responsibilities (T2M1) Develop an internal communication platform for sharing information with different city authorities and emergency services (T2M2)	Develop a common understanding of resilience between the different stakeholders (T2A1) Involve academia and the scientific community to improve resilience planning (T2A2)	Establish a mechanism for public consultations to receive feedback on the resilience plan and modify accordingly (T2P1)	Involve all stakeholders developing, modifying and assessing plans (T2R1)

Funding structures	Resources to build up resilience (F1)	Assess current funding opportunities for the development of resilience (F1S1) Establish a disaster relief fund for emergencies (F1S2)	Provision for a resilience action plan in the local government budget (F1M1)	Encourage insurance coverage (F1A2)	Promote R&D in building resilience (F1P1)	Incentivize resilience-building measures (F1A1)

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The Use of Knowledge in Projects - A Discourse on Planning

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ABSTRACT

In the Nuclear Power Industry regulations are delineated, the standards are explicit, the engineering processes are mature and tested, and organizations are trained to adhere to rules of engagement and the Industry mandates a culture of sharing historical experience to help avoid the pitfalls experienced by others. The rigor, the discipline, the sharing of experience, and learning from mistakes should all lead to better planning and execution. However, this does not hold true. The problem is one of knowing what knowledge a team needs to plan a successful project and how to acquire it from the marketplace.

F. A. von Hayek, the renowned economist, contemplated on the fullest use of knowledge in the planning of economic activities in society and in 1945 published his paper on the subject titled "The Use of Knowledge in Society"[1] Hayek postulates that in the marketpalce, people, through the facitlities of communication available to them, come to the resolution of concerns with the formation of a rational order which ensures the best use of available knowledge.

This paper examines Hayek's discourse on the use of knowledge in society and explains how projects can benefit from it by the creation of a rational order through storyboarding. It presents a methodology for storyboarding that can capture the very essence of Hayek's inquiry into planning through six key elements. It also deliberates Hayek's postulations and points to examples of success and failures in projects including the work by other scholars who have contributed to the management of knowledge in the Industry as it lays the groundwork for Storyboarding.

INTRODUCTION

Hayek's discourse on the subject of knowledge dispersement, accumulation and application in society lays the groundwork to planning of complex endeavors in the marketplace. Projects are essentially the coming together of people with different prespectives whose inputs guide the planning process. Hayek's postulations as they apply to planned and focussed activities undertaken by organizations is key to understanding how people build narratives that lead to action. The process of building and knitting narratives together requires an understanding of all of the elements that Hayek alludes to, along with the nurturing of a thought process that seeks out knowledge. The six essential elements of Hayek's observations and

postulations that need to be understood and embraced to create the narratives that build the story of the project are; .

1. The rational order
2. Use of facilities of communications
3. Dispersed Nature of Knowledge
4. Habits of Thought
5. Man on the Spot
6. The price system

A grounding in Hayek's discourse is an essential beginning to storyboarding. The arguments presented herein substantiate Hayek's postulations as it chalks out an approach and methodolgy to storyboarding of projects.

THE PROBLEM

Creating a Rational Order

A rational order comprises of people, process, knowledge and technologies available in the marketplace and relevant to the planning effort. Planning requires the selection of people who understand the flow of information and communication of knowledge in complex networks of people in the Industry and marketplace. This requires the construction of an organization that understands the creation of the "Rational Order" to harness the knowledge to support the initiative.

The problem of constructing a rational order to undertake the planning and execution of a project is complicated by the fact that the knowledge of all the circumstances a plan must accommodate does not exist in a concentrated or integrated form. This knowledge exists as dispersed bits of incomplete and frequently contradictory information in individuals who may or may not be part of the organization of people planning and executing the activities. The ways in which knowledge is conveyed to the planners and the process through which it is used is one of the crucial problems.

Hayek's discourse on planning provides projects with multiple approaches. Should this planning be done centrally by one authority for the whole project or should it be decentralized and performed by many individuals. Yet another form is one where certain planning is delegated to organized groups where the narrative of these organized groups supports only part of the narrative and are removed from the objectives of the central plan. Which of these systems is more efficient and appropriate depends solely on which of them makes fuller use of knowledge. Project managers should be aware of the bias that exists within organizations that all that is needed is known and what is known is understood by the organization. Not knowing

what one does not know is at the root of such problems where the rational order created does not capture the knowledge required.

The Use of Facilities of Communication

Hayek postulated that people somehow through the facilities of communication available to them find ways to efficiently or inefficiently arrive at resolutions to their concerns. Projects bring about the organization of knowledge, skill, process, tools, technology, and materials in specific horizons of time. They exist in an environment within a social structure with pre-established behavioral norms and for a purpose to yield economic returns in pre-determined time frames. Hayek's enquiry into how planning is conducted through the emergence of a rational order opens the door to creating one. Planners can build the story through a set of questions relevant to the planning of projects. The clear focus would be the two key elements of the rational order; people and communication structures. An enquiry initiated by a set of questions focused on the objectives of the project would help in the creation of a rational order.

1. How do we know what is required and who is to define it?
2. How do we acquire all the relevant knowledge required?
3. How is this knowledge communicated and used in planning?
4. How is this planning to be done?
5. How does one measure the effectiveness of such planning?
6. How is the final outcome determined?
7. How are we to organize to formulate a plan that captures possible and relevant responses to these questions?

Developing responses to these questions requires an understanding of how knowledge feeds planning. Projects very often fall prey to the assumption that people's knowledge corresponds with the objective facts of the situation. The shortcomings in people's knowledge is not evident unless probed. This creates a need for a process by which knowledge is consistently communicated and acquired. The arbitrarily scattered and imprecise nature of knowledge in the marketplace, the everchanging social fabric and the facilities of communication within social networks contribute to this burden of planning projects. The communication of knowledge to the planners of the project can only occur if the existence of people with special knowledge is known to the planners. The central planners are occupied with creating a plan focused on the strategic objectives whereas those with special knowledge are occupied with specific problems and possible solutions. This difference in focus can make communication of such information difficult, thereby limiting its inclusion in the planning process. Knowledge of social interactions in the marketplace and in Industry are vital to the acquisition of practical knowledge.

Dispersed Nature of Knowledge

We speak about knowledge as if it is structured and available to everyone. The contrary is true and assimilating knowledge relevant to the project being planned requires an understanding of what constitutes knowledge and how it resides within people who make up the marketplace. Scientific knowledge, supported by scientific and engineering principles, occupies such a prominent place in people's minds that the relevance of other kinds of knowledge are quite often ignored. There is a body of very important but unorganized knowledge which cannot be called scientific and which has a bearing on all planning and execution. The knowledge of particular circumstances, of time and place, of observations of the marketplace and of failure and success that reside within people are vital to both planning and execution. Knowledge of market economics, global demand and supply, competition, trade policies, environmental issues, cultural changes, political changes, immigration policies, skilled labor availability, transportation and logistics, contractual issues etc. may play a very important role and yet there may be other areas such as knowledge of circumstances and situations which may never surface until forced by events. Knowledge of communications and other relevant areas is not just ignored but is considered inferior to the knowledge of scientific facts and figures. This prejudice has to a great extent affected the attitude towards commercial aspects of planning in general.

A good example of non-scientific knowledge is Housekeeping. Japanese companies adopted Hiroyuki Hirano's 5S Housekeeping process[2] (Sort, Set in Order, Shine, Standardize, and Sustain) to introduce a structured thought process within the company in developing and integrating housekeeping processes and technologies into economic activities to yield improvements in quality and costs. The process employed a very different kind of knowledge which until its introduction was not understood but was assumed to be common knowledge. Yet another example is how Knowledge of the commodity markets allowed one utility to hedge on the price of copper and steel used in the manufacture of large transformers. The treatment of a technical procurement as an economic activity resulted in the application of commercial and market knowledge to procurement planning, which yielded savings by timing the purchase of the metals to price drops.

About Tacit and Explicit Knowledge

Practical knowledge may be explicit and made available to the planners but some of it resides in people and described in knowledge management terms as "Tacit Knowledge". Knowledge acquired from individuals is never in the form that is readily usable for planning projects. This is best described by Ikujiro Nonaka in “The Knowledge Creating Company”[3] where he defines the creation of new knowledge through interactions between those that possess the knowledge and those that transact

for it and use it. Project managers should be aware of the four basic interactions that lead to the creation of knowledge required for planning - From Tacit to Tacit, From Explicit to Explicit, from Explicit to Tacit and from Tacit to Explicit. Each one of these interactions are essentially transactions where there are offers, acceptance, rejection, modification, acknowledgement, and agreement in structured environments designed to seed, invoke and stimulate thought and analysis to create new knowledge.

The Habits of Thought

Hayek postulated that use of available knowledge in society stems from habits of thought cultivated over years and is deep rooted in the culture and traditions of organizations. This holds true for organizations that plan and execute projects. Habits of thought are part of our past, our education, our culture and our experiences. Most managers rely heavily on experience and on their own organization for knowledge relevant to their projects. The tendency driven by habits of thought has led managers to accept only those plans that are understood by their organization and ignore the existence of other forms of knowledge in the marketplace. Rather than seeking responses to the questions relevant to the project in its specific horizon of time and space, managers find it convenient to pick solutions based on previous successful implementations. This would be analogous to a football team pursuing a game plan from a previous victory and expecting a similar result. The habits of thought that have been cultivated in Industry to deal with the natural evolution of knowledge in the marketplace require organizations to bridge the chasm between experience and new knowledge.

A fallacy that is embedded in these habits of thought is that practical knowledge of the marketplace and of circumstances and situations is readily available and at the command of everyone. There is also an assumption that success by others can be replicated. Replicating the past has its flaws. Some obvious ones are - the experience of organizations with similar skills but different people have different levels of competency and capability, lessons from previous execution were at a different time and place, the pricing structure in the marketplace is different, obsolescence of methods and technologies alter the conditions of satisfaction, new methods and approaches embraced by the Industry alter outcomes, new regulations challenge the criteria for acceptance, and loss of critical knowledge and skill due to attrition creates voids which are difficult to overcome.

Most assessments focus on lessons from mistakes made and do not evaluate the causes for success. The reasons for success are embedded in planning and in organization of people - some who have very little to do with the project. In example, the expediter of a shipment who helps meet the schedule uses new knowledge in the marketplace to move goods and services and is oblivious to what the project is trying

to accomplish – the man on the spot. The difficulty lies in the fact that project execution seldom documents the reasons for success or the method by which knowledge was communicated to all the members of the project team.

Man on the Spot

The small changes that occur during the execution of a project and the adjustments made to overcome cost increases during the execution of activities and tasks have a significant bearing on the outcome. The actions to counter the changes require the kind of knowledge that is neither scientific nor are they explicitly laid out in the plan or any other document. This knowledge in people may never surface unless a situation occurs where the circumstances, when defined, triggers its extraction. Logic dictates that ultimate decisions be left to those who are familiar with the circumstances and who know what resources they need to bring to bear at that point in time. The dynamic nature of such problems and the knowledge required to solve them resides several layers removed from the central authority which controls the scope and changes. Hayek defined this as the "Man on the Spot". The man on the spot is familiar with the situation and the circumstance and has intimate knowledge of the facts of the immediate surrounding but does not possess the ability to assess the entire situation. Communicating this knowledge of circumstances to the central authority to arrive at a solution is precisely where organizations designed to control projects through processes fail to grasp the nature of this predicament.

An example that illustrates this problem is when a new transformer at a power plant tripped during startup. The outside consultant - "Man on the Spot" concluded that the condition that had caused the trip was now no longer present. The plant continued with the process and the transformer successfully went online. The consultant reached his conclusion from previous experience and knowledge. The loss of revenue from not being able to go online and transmit the generated power would have been very difficult to accept and explain.

The Price System

One area of knowledge that is both dynamic and unpredictable is the price system in the marketplace. According to F. A. Hayek - No other knowledge influences the formation of a rational order in the marketplace other than the price system. The price system communicates information that forms the basis for action by individuals in the marketplace, each with dispersed, subjective, and often contradictory knowledge. The knowledge communicated by the price system drives the coordination of actions in the marketplace.

Quoted prices that are heavily relied upon by projects undergo constant changes in the marketplace. The price system is not a product of human design but human

behavior in that it is a response to circumstances and conditions and is speculative in nature. It is a product of social interactions in the marketplace where very little thought is given to the circumstances encountered and responses are driven by learned human behavior that reflects the practices which evolved over years of human existence and which have proven to be successful in the past. The pricing system establishes the true value of what is gained and what is lost or in short, the variance from the planned costs.

The Price System helps us dispense with the need for conscious control and move to providing the necessary inducements to individuals to do the desirable things without anyone pointing them to what to do. Inducements trigger the use of special knowledge of circumstance and produce the required outcomes without any involvement from those creating the inducements. The design of contracting strategies to recognize and respond to the price system and to the change in states in the marketplace are critical to projects. The creative design of inducements to stimulate innovation depends on the planners and reflects the effectiveness of the rational order constructed. This is one area that is beyond the control of every project manager who need to be aware of the fact that plans that rely on past performance may not fully understand the circumstances underlying the favorable pricing at that time.

THE SOLUTION

Creating a Rational Order for Projects

The success of the projects depends on how they are organized and structured to extract from the marketplace the requisite knowledge through all the situations and circumstances from inception to completion. The rational order is not clearly obvious until one embarks on defining it. It is this recognition and creation of the rational order that has been the root of success experienced by those planning complex long-term economic endeavors. These may appear to be abstract concepts but as a project begins to embark on specifics, the nature and form of the order appears in the organization of people who in many ways are not even aware of the goals of the endeavor. It is this organization that helps build a powerful storyboard. The process of building this story entails the following:

1. *Building the project team*
2. *Designing Conversations*
3. *Capturing the Elements of Storyboarding*
4. *Managing Risk*
5. *Creating the Story*

Building the Project Team

An essential part of the story is about building the project team. The objective of a Project is to build an organization with the structure essential to planning that ensures the full use of knowledge available in the marketplace. This may be as simple as an organization of people in a single community to a network of knowledge sources interwoven into a complex mesh which one needs to sort through to harness that which is relevant to planning. The natural tendency is to seek experience and not to enquire about knowledge. The term experience has been used to respond to queries about knowledge and to pacify the anxieties of management. The right kind of experience is relevant, and the knowledge brought to bear from such experience is vital. However, it is important to understand what experience means.

Knowledge from experience may be biased in that it only reflects the ability of the organization and not what was then available in the marketplace. It does not indicate if the experience made full use of the knowledge available in the marketplace or the Industry. In the case of projects, the selection of a few members of a previously successful team to replicate performance of a dismantled team is at the heart of this problem. Projects that assume that their organizations possess the knowledge required to navigate through all the circumstances that they may encounter do so at a very serious risk. They blind themselves to the existence of gaps in knowledge within their organization which contributes to a failure of comprehension of situations and circumstances that the project needs to overcome which eventually leads to cost overruns. This has been proven time and again in many a project.

The primary role of management is to recognize that a project conceived in a marketplace has to draw from it through its own organization and structure. This is analogous to a plant placed in soil which is the source of all nutrients it needs to grow and yield fruit. Botanists who understand the science behind plant growth and yield, recognize the current conditions, future situations and circumstance and put in place mechanisms to overcome threats to the growth of the plant. This is akin to projects undertaken by entities. Allowing the creation of communication structures that extend beyond the organizational structure of the entity into the marketplace in which the project has to be planned and executed is essential to reaching the conditions of satisfaction sought by management.

Designing Conversations

The acquisition of knowledge from social environments in a structured form explicit enough for use in planning is a subject partially addressed by Hirano through his introduction to Housekeeping as a topic of conversation. Hirano recognized the importance of conversations designed to create, innovate and act. A key element that is critical to all economic activity is the design of conversations around planning. As all actions are designed from narratives constructed from conversations it is important

to delve into the ontology of conversational structures. Conversations in social environments create narratives which formulate the basis for action. The design of actions is yet again initiated in conversation driven by thought applied to the narrative. Thoughts are initiated by Information and the analytical ability of the members of social environments. Information has context, history, background, relevance to past and future action, linked to already existing practices, trends and behavioral norms. Processing information within all complex structures is accomplished by linking knowledge fragments to form explicit inputs to narratives. This linking is accomplished by the sharing of thought through conversations in a structured environment designed to align with missions and goals. The structured environments are platforms that can be used to establish a cadence for interactive exchange between knowledgeable individuals to design actions. The chronological knitting of narratives from interactions between people lays the foundation to storyboarding.

Capturing the Elements of Storyboarding –

Storyboarding is an important tool for planning and visualizing the possible outcomes. It is the creation of the foundation upon which the story is built. Stakeholders can visualize and weigh in on interim states and outcomes as well as identify risks posed by future conditions not considered. A time-lapsed depiction of a scaled model provides the project team with a view into the problems and efficiencies of execution. There is more than one way to create a storyboard and the most effective are the ones that use a combination of narrative, images and virtual reality software. Effective storyboards written in a clear, concise and readable style make for easy comprehension and lead to better engagement of the readers.

All storyboards are defined in a chronology and have a beginning and ending. They are initiated at a specific time and grounded in the current state of the marketplace. Current states are a product of the past and reflect the successful or unsuccessful execution of plans which made full or partial use of available knowledge. Predictions of the future based on current states require an understanding of the marketplace and a recognition of the plans already in motion to alter the current states. Projects have to contend with the prediction of states in the form of risk. Knowledge to understand, transfer, and mitigate the risks is crucial to the success of the project and should be captured in the storyboard.

Managing Risk

The story of managing risk is an essential part of a story board. Projects are created as objectives and the identification of risks that can drive variability in performance is left to the project managers. The problem with risk management is that it is dominated by lessons learned from the past. The reliance on the past blinds' projects

to the current conditions in the marketplace and the situations and circumstances that may have to be dealt with in the future. Knowledge required to address the situations and circumstances of the current and future market states reside within people who may not be within the project's organization. The awareness of this reality is crucial to planning the mitigation of the risks identified.

The nature of human beings to innovate produces new circumstances and adds to new problems and demands new solutions. There are no good answers to any of the circumstances and situations caused by innovation. Organizations that partake in discourses and deliberations about the new conditions are better equipped to address the needs arising from the new events. The key is to acquire the knowledge to build organizations with vigilance and intelligence to address the strategic risks faced by the entity in the marketplace by developing the stories about risk.

Creating the Story

A project is the story about how an organization tasked with accomplishing the strategic objective puts together an actionable plan. The story is about how individuals and organizations interact and transact with each other to develop the narrative which is the plan. The manner in which a project creates the interactions and the design of conversations are essential parts of the story. Management is tasked with pulling together all the knowledge required to plan the endeavor and to develop the story that can be narrated to the project team and the stake holders. This is one of the most difficult aspects of planning.

The three essential ingredients to building a story are Information, knowledge and communication structures in the marketplace. A fundamental understanding of these elements leads to an inquiry that fuels the narrative. The knitting of the narratives requires knowledge of situations and circumstances that may be encountered. Storyboarding is the process through which a well-thought-out plan emerges from an effort that focuses on pre-planning. The organization and structure of the endeavor begins to emerge from this effort and the plan begins to take shape. The integration of the project's objectives with the market forces become evident and the issues, constraints, future situations and circumstances are identified and acknowledged. The creation of powerful narratives requires projects to recognize the value of storyboarding –building narratives from transactions of knowledge and information.

CONCLUSION

Projects are stories about how organizations put together an actionable plan and execute it. The stories are about individuals interacting and transacting with each other to develop the narrative, which is the plan. The sourcing of knowledge required to support the narrative and address the situations and circumstances leads to

identification of individuals and organizations that make up the rational order. The contribution of all the individuals who have a role to play in the story help develop the narratives. The knitting of the narratives with knowledge of current and future states builds the storyboard for the project.

Performance measurements of storyboarded projects are more reliable and provide for opportunities to introduce corrections to the narratives with new knowledge or with experts who can swing the outcome in the project's favor as in "Man on the Spot". As states change so should the narratives and the project plans. Narratives that contain the basis and knowledge sources behind the planned actions including the situations and circumstances lay the groundwork for change. The rational order that emerges from the narratives plays a critical role in determining new courses that projects embark on as states change. The narratives are as much about the creation of the narrative as they are about the content of the narrative. It is about the fragments of knowledge dispersed among people within and outside the entity planning the endeavor, it is about the state of the marketplace, it is about the situation and circumstances of the future and its causes, it is about strategic and operational risks, it is about the design of conversations and communication structures, it is about plots and sub plots, it is about the environment, it is about chronologies, it is about uncertainties and certainties as well as possibilities, and above all within each narrative it captures the states of knowledge, past, current and the future.

The purpose of a well-knit story is to stimulate minds to remain vigilant to changing states. This vigilance ensures sourcing of the required knowledge to overcome concerns and to mitigate risks posed by situations and circumstances. The power of narratives helps define the rational order that ensures the fullest use of knowledge and helps build the story to success. The most important aspect is the ability of storyboarding to capture the imagination of people within and outside the organization through narratives. The story can be made available to other organizations which can with its own knowledge modify it and blend it into their story. These stories speak to those who seek to understand and build a rational order from the marketplace. All narratives are relevant but the ones which make fuller use of knowledge are more powerful than the ones that don't.

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