

The Problem with Complexity:

There are complicated and there are complex projects ¹

(Part 2 of 2)

Charles Villanyi Bokor

“Got it.” Bob said in a manner that was most satisfying, because it made both of us feel that we understood that any easy, ‘off-the-cuff’ answer offered by an SME (subject matter expert) to a complex project’s problems, is probably going to be insufficient to actually solve the problem. So, the ensuing silence indicated that he was after a more thought out explanation of why his project was in trouble.

Life is simple, but for the decisions (we need to make)

“Many system development projects start out being relatively modest in size and relatively straight forward, as for example your project, which was to replace a legacy system.” I started out saying breaking the silence. “Generally, and exemplified by your case, the aim of a project is known and documented in the business case. When the existing business processes are to be left unchanged, whether they need to be reengineered or not, and no new functionality also known as new business requirement, is to be added to the expected output, the scope of the project is also known. So, the so called ‘high level’ system design, is straight forward, almost ‘doable over coffee on a napkin’. Therefore, based on the amount of work to be done dictated in part by the level of difficulty the project presents, the existing environmental capability and the operating executive governance, the trained professional project manager (PM) can define the resources and the skill level needed for an impending success. So, most people assume that development should be a ‘slam dunk’, and that the PM will produce the specified-in-the-design output, by following the PMI (Project Management Institute) manual and / or the dictates of the organization’s standard development methodology. However, often the results differ from expectations, as exemplified by many projects still struggling to deliver their new application systems years after they started development.

Unlike the jingle: "It all started with a big bang", on the TV series called *The Big Bang Theory*, some projects start out as small-ish and then grow. Some also morph. According to one definition, when a project employs more than 25 people, goes on for over two and a half years, adds new stakeholders during development, uses up more than 60 person-years in developing over 100 thousand (K) lines of code (LOC) [1- Gibbs, 2013], and costs more than \$10 million in

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development (excludes cost of deployment), it is said to be a different type of project. Some call such a project a Super Sized Project (SSP) [2- Villanyi Bokor, 2017].

For some of these SSPs, the number of planned tasks or steps, some of the planned tasks or steps, as well as the development methodology, have to be tweaked during the development cycle, due to changes to the technological platform (e.g. adoption of cloud computing), changes in the understanding of the problem, introduction of new constraints, changes in people and / or their existing relationships (caused by the addition and or replacement of the original stakeholders and / or executives conducting the oversight). In turn and as a consequence, these changes impact other project tasks or steps, so other unforeseeable changes have to be made. Rick Nason states (Preface xv) this as: "... what worked yesterday may not work today...". So, it is to note that for these SSPs, continuous planning is more important than following the original plan, and their predefined outputs end up being somewhat different than what was originally planned. We will refer to these types of projects as complex [3-Nason, 2017].

Bob, the standard project development methodology was developed on the assumption that projects are complicated because they have a large number of interconnected parts. So, many PMs are trained to manage complicated projects. However, as a result of this, probably 19 out of 20 PMs will argue that there is no difference between complicated and complex projects, except of course in size, and that therefore all projects can be managed the same way. This is to be expected. "Paul Wason's experiments in the 1960s on "confirmatory reasoning" revealed the human tendency to look for and select evidence that supports a particular hypothesis, rather than that [evidence] which contradicts it." [4- Cooke-Davis, 2011] Further, most PMs (the (Solomon) Ash Conformity Experiment), [5- McLeod, 2018] are seriously bolstered by the views of others, and many do not have the authority to manage as they wish, thus they prioritize the safety of consensus, even if it differs from their professional opinion and allow 'groupthink' which often leads to flawed decision making. Arguing or thinking that these two types of projects are the same, does not make it so, even if that is the consensus of the majority. Remember most people will argue that there are 24 hours in the day, forgetting the 59 seconds. Some may think and argue that a Ferrari and a Jeep can both be driven through snow the same way because they are both cars, or that they both make financial sense, but that does not make it so. There is nothing wrong with PMI's methodology and the preceding is not to argue that current project management practices and standards are to be updated, but that the current project development methodology is for managing simple and complicated projects "... that do not warrant the label "complex". [6- Cooke-Davis, 2011]

Your PM, Bob, is managing a complex project as if it were complicated. As a result, he is not planning continuously, does not actively anticipate and mitigate changes, adequately look for and respond to needed changes, does not factor into the required effort the changes that are necessitated by the changes that had to be made. He is reacting not being pro-active, tries to shape the environment to fit the plan, and his reports are about what has happened, not why or what has to be done as a result. Reports seldom and reluctantly voice the changes that are needed (or likely to

be needed), or actions taken on ‘gut feelings’ to make the changes when circumstances required them. There is a difference between telling you that because you went outside and got wet, it is raining, and telling you that if you will go outside you will get wet. This approach (managing a complex project as if it were complicated) exacerbates the exceeded project’s estimated time and estimated budget and most likely, will deliver something that at best is different from what you expect and at worst will almost be useless in supporting the expected business outcome. Due to this approach, your PM is overly optimistic that events identified in the original plan and needed to take place in order to achieve the desired output will happen, so he expands little effort to change tasks of this complex project and even less to mitigate future changes. To his credit, it is common to overestimate the likelihood that events that must happen to support other events, will happen.

According to H. L. Mencken: “For every complex problem there is an answer that is clear, simple, and wrong.” So, while I cannot whip up in 2 minutes, a clear and simple answer that will solve your complex problem (7- Villanyi Bokor, 2020) a solution does exist. It is not gloom and doom, Bob. If finding the answer were to be easy, you would have already whipped one up a while ago, and the need for my expertise would be waning. The problem here is not that a solution does not exist, but rather, as in most cases, that the people who have to implement the solution do not understand the solution and do not implement it or implement their version of it.” I stopped talking, but kept on thinking “... there is considerable evidence that organizations in many industries that undertake complex projects are faced with a shortage of skilled people [4- Cooke-Davies, 2011].

So, all that was of importance had been said, leaving Bob with only two choices. He could reject the notion that complicated projects and complex SSPs are different types of projects, call the whole thing off, end the discussion, say goodbye and drive off. Executives are under pressure to predict positive results, and have inconsequential consequences for being wrong, so they do what is expected. This choice would therefore make sense, as it is not easy to admit that a well laid out project management plan (PMP) that is supported by the stakeholders needs to be changed. When people espouse an idea, even evidence to the contrary will not persuade them to let it go. So, were this to be his espoused choice, he would choose to continue on the path he was already on, the proverbial ‘same old, same old’. As a second choice he could be open to new ideas, accept the foregoing summary and ask for a dissertation on how to make the changes that are needed to be applied to his specific problem and complex SSP.

“OK. So, explain to me this concept and the steps you will outline, that will change the foreseeable outcome.” Bob stated after a long pause, having the courage and leadership to chose the second alternative.

Some projects are complicated, and others are not

“The other day, I was searching and found violins for sale ‘on-line’. Bear with me, Bob. They were bargains. One was offered for \$65 and the other cost \$69 USD. Looking at the pictures on my screen, they were indistinguishable. They were both made of wood, had the same number of strings, were about the same size and looked just like one of the violins in a specialty shop, made by a luthier, which cost \$7,000. Were I to play one of these less expensive models, an SME would instantly realize that I am not (a professional) playing the one from the specialty shop.

Similarly, to the analogy, there are nuances between projects. I think of complicated projects as jig-saw puzzles. They have a fixed number of components, each of which is defined, each component has a fixed number and a specific relationship (way of interfacing) to some of the other components, and the project delivers an expected output. Many PMs know how to list the components of a project, identify the project’s scope and the pre-defined approach to be followed to attain the output. These PMs then focus on fending off changes to the development environment so no changes to the components or to the approach have to be made. However, unlike complicated projects, the number of components in a complex project can change, and some of the components will change unexpectedly during development. So, the number and the relationships between the components can also change, and consequently the originally defined output will also change. This type of project forces changes to the standard methodology. Your project, Bob, seems to be such a project, as its present output is no longer expected to be exactly what you had in the legacy system, indicating that your project become complex [3-Nason, 2017]. Hence, your project must be led by a Project Leader (PL) who can lead not only manage, prepare for (not only anticipate and react to) and make (not only report on) the needed changes, when these are needed, to adapt to the development environment. Admittedly, changes also occur in complicated projects, however, these do not impact the project’s tasks, methodology and expected output, as much as in the case of a complex project.

Methodology

The standard development methodology described in the PMBoK (Project Management Book of Knowledge), corals the ‘follow-strict-project-management-guidelines’ PMP (Project Management Professional) to treat and attempt to develop all projects the same way. Its rules define the steps, define the relationships between the people on the project and the decision-making process that is to lead to the predefined deliverables or output. Using such a well-defined methodology, were a project to be developed over again, it would deliver the same result both times, like a jig-saw puzzle.

In contrast, the methodology to develop a complex SSP needs to anticipate changes and be flexible. While developing a complex SSP, not one task or step, but rather many tasks or steps will need to be done differently than the way they were planned. The differences between the two

methodologies may not be readily obvious to the uninitiated, uninterested or non-critical PM, but they are real. The most striking difference being the decreased efficiency with which the complex project's methodology uses the project's resources. Why is it less efficient? Because the complex project's methodology anticipates the PL making changes to planned tasks or relationships, and so makes greater investment in mitigating actions that protect the project's viability. These investments, become a 'wasted effort' for the changes that do not have to be made and for the changes that become different than anticipated, hence the inefficiency.

In contrast to a complicated project, two complex projects developed the same way, would probably deliver different results due to different environments, changes needed during development, different relationships and different reactions to them and different PLs making changes. It is impossible to predict the exact output of a complex SSP, which turns out to be like but not exactly what was anticipated. I think of two tomato seeds planted in two different types of soil, or the same application being developed in two different government departments. This makes the original plan, while necessary (the process and benchmark), less important than the continuous process of planning, which is vital, and implies that the output and often the outcome (business outcome or the level of business success) that complex projects deliver (facilitate), cannot be precisely predetermined. This is not to say that complex projects cannot be managed, but that complex projects meander at times out of control, overshoot their timeline and their budget. As an example, Bob, your unexpected achievements are exactly what should have been expected."

"They meander?" asked Bob.

"Well let me say this. Yes. While complex projects are expected to overshoot their timeline and their budget due to the changes that will have to be made, the overshoot is expected to be a fraction of the additional time and budget that a complex SSP managed as a complicated project will incur, and which will be denied to have happened or explained as a result of external sources. A complex SSP methodology is more realistic, admitting that necessary events for subsequent events may not happen, and facilitates making an investment in mitigating actions that are required (documenting potential risks is not mitigating them).

Dr. Edward Lorenz was building computer models of how weather patterns develop. He noticed that "... he achieved very different results with his models when he stopped at an intermediate point than when he let his models run continually without stopping." [3-Nason, 2017] In chaos theory this proposes that small changes in the initial conditions can produce large differences in a complex (nonlinear) system."

"Is this what some people refer to as the *Butterfly Effect*?" Bob asked.

"Yes exactly." I replied enthusiastically as it indicated that Bob is following the logic. "Because for all sorts of reasons you have been stopping at intermediate points, Bob, I am suggesting that

things have changed when you stopped, and so you have not come with the project to the same point that you aimed for in the original plan.

The analysis

As Nason puts it [3-Nason, 2017]: “It is often the case that the harder one works on complicated thinking, and the more effort one puts into solving a problem, the worst the ultimate outcome will be if the situation is complex.” So, we have to change how we resolve a complex SSP, and change from doing more to doing it differently. Complexity requires leadership and the PL of a complex SSP must understand not only what steps and tasks are needed but also why they are needed, prepare for the inevitable changes, and when a step and task needs to be changed, act on his/her ‘gut feelings’ (make judgement-based predictions, or decisions based on incomplete information) to make the change not only report the need to change. So, PLs have to understand risk, organizational limits and human behaviour. This is a higher level of project management and simply having a PMP certificate is inadequate. The need for a PL is not because PMs make bad decisions when working on complex SSP, but because their decisions do not lead to good outcomes. Think about it this way, a PL making a decision not to do anything resembles a PM procrastinating or waiting for approval to do something, but it is fundamentally different. Documenting lessons learned from doing things that have not worked in the past is not solving our problems. As George Bernard Shaw said: “We learn from history that man can never learn anything from history.”

To develop a complex SSP, the PL will have to:

- plan continuously, as this is more important than the original project management plan (PMP);
- anticipate and mitigate changes, i.e. invest in mitigating activities, make changes (do what has to be done and take responsibility), forewarn of changes to the output;
- modify the tasks or steps that need to change on a complex project, when they need to change to adapt to the environment;
- exercise the authority as per the new methodology to make changes and factor in (anticipate, prepare for and allocate resources to) the impact of the changes that had to be made and the changes to be made due to changes that had to be made;
- resist catering to the wishes of stakeholders as to how to manage the project;
- report why changes had to be made and the deployed solution, not only what happened or what went wrong; and
- take responsibility for the decisions that had to be made.

How do things go wrong? In conclusion

In books, articles and in the heads of a minority of specialists, we have the knowledge needed to improve the success of large projects. But, the average PM’s body of knowledge has not grown to

include the expertise needed to lead large complex projects. This is in part because according to conventional wisdom complicated projects and complex SSP are the same (electric cars reduce pollution). Conventional wisdom is wrong. Complex SSP need a different methodology (electric cars in some circumstances, reduce pollution).

Complex SSPs that are relatively modest in size at the start and relatively straight forward but then grow, will require changes to planned tasks or steps during the development phase and their originally defined output will not be exactly as planned when delivered. This will not be because of any incompetence, or weakness in the original or on-going planning but because of the nature of the project. So, complex SSPs need a modified methodology and must be lead by Project Leaders (PL) who need to continuously plan, can lead not only manage, who prepare for (not only anticipate and react to), mitigate and respond to changes, understand human behaviour and make not only report on the needed changes.”

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About the Author



Charles Villanyi Bokor

Ottawa, Canada



Charles Villanyi Bokor is a Strategic Management Consultant focused on *Leading to Better Decisions*. Principal activities include Business Transformation, Problem Project Recovery & Leadership, and Strategic Planning. Charles works mostly in Ottawa but has successfully completed assignments in Florida, Wales, Malaysia, Sweden and Australia, and was key-note speaker in Johannesburg, South Africa and Victoria BC. Formal education includes an Executive Development and Diploma in Management (McGill), M.Sc. Mathematics (Université de Grenoble, and de Montréal) and B. Sc. Mathematics (Concordia). He is ITIL Certified, an ISP and a TBS Independent Project Reviewer and was Program Director of the *Corporate Performance Management Program*, Sprott, Carleton U.; Director of IS/IM at Royal Trust; and at Northern Telecom; CMC; CMC Board Member; PMI-OVOC Board Member; Governor of ICCO. Charles can be contacted at Charles_bokor@rogers.com.