

Can the use of a multi-dimensional WBS help salvage your IT project?^{1, 2}

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ABSTRACT

This paper aims at finding a way to increase the success rate of IT projects in companies. Indeed, the failure rate of such projects remains rather high and can have disastrous consequences in terms of cost and time lost.

To solve this issue, we will consider the different alternatives possible, alongside with the best attributes to evaluate the value of these alternatives. The next step will be to use Multi-Attribute Decision Making (MADM) methods, so that we can find the fittest solution to the problem at hand. At the end of the study, we will prove that the best solution is the extensive use of multi-dimensional Work Breakdown Structures (WBS), thanks to a Pareto analysis.

Keywords: Work Breakdown Structure, Software, Failure, Information Technology, Standardization, Globalization, Communication, Technical jobs

INTRODUCTION

The Information Technology, or IT, industry, despite being a rather new industry, has quickly become one of the strongest, since the beginning of the 21st century, spending over 4.5 trillion dollars in 2017. According to expectations and scientific researches, it was expected to “eclipse the \$4.8 trillion mark” in 2018³. It is acknowledged as one of the fields which contributes the most to the GDP of developed countries. Not only has it become an incredibly resilient industry in a few years, but it also enables all the other industries to be way more efficient than they used to be, with the implementation of brand new software and the spreading of revolutionary ways of communicating. Thus, it can be described as a “key driver of global economic growth”⁴. As far

¹ Editor’s note: This paper was prepared for the course “International Contract Management” facilitated by Dr Paul D. Giammalvo of PT Mitratata Citragraha, Jakarta, Indonesia as an Adjunct Professor under contract to SKEMA Business School for the program Master of Science in Project and Programme Management and Business Development. <http://www.skema.edu/programmes/masters-of-science>. For more information on this global program (Lille and Paris in France; Belo Horizonte in Brazil), contact Dr Paul Gardiner, Global Programme Director, at paul.gardiner@skema.edu.

² How to cite this paper: Vallet, G. (2019). Can the use of a multi-dimensional WBS help salvage your IT project? *PM World Journal*, Vol. VIII, Issue VII, August.

³ Comptia (website – January 2018) - *IT Industry Outlook 2018*. Retrieved from: <https://www.comptia.org/resources/it-industry-trends-analysis>

⁴ Economywatch (June 2010) - *IT Industry, Information Technology Industry*. Retrieved from: <http://www.economywatch.com/business-and-economy/information-technology-industry.html>

as the workforce involved in the industry is concerned, it has become one of the industries with the highest number of employees, employing about 6.1 million workers in the US in 2017, according to estimates, representing an increase from almost 1.5 million in comparison with the previous year, which makes it “the largest and fastest growing category of tech jobs”⁵.

Another strength of the IT industry is that it requires people with various skills, be it soft or hard skills. Thus, the tech industry does not only require technical positions, with great software development skills, but it also includes salesmen, HR and even marketing⁶. Even the technical field is rather broad, with numerous jobs such as systems architecture, database development, maintenance and security services.

But although everything seems bright at first sight, the situation is in fact way more complicated than it primarily seems. Indeed, having access to state-of-the-art technology is no longer an advantage over the competition, but a requirement to remain competitive in an ever more globalized world, where distance and dematerialization have become the trend. The Blue Fox Group Blog mentions “7 Reasons Why Every Company Needs IT Support”⁷. These reasons are economic, managerial ones, as well as putting a strong emphasis on the time gained thanks to the use of such technologies.

But before going further, I should highlight the fact that IT projects share the same kind of complexity than other kinds of IT projects and are consistent with the Guild’s definitions:

	GUILD DEFINITION	IT PROJECT EXAMPLES
Project	Special environment created in order to deliver one or several business outcomes, in a frame of a specified resources.	Projects can belong to four categories: Revenue Generating or “Top Line Projects” (creation of a new software which will generate benefits, such as Catia for Dassault Systemes), Cost Containment or “Bottom Line” Projects (realization of a software inside the company, for employees, which will enable them to do their work more easily), Government Mandated Projects (Utah’s Public Finance site which promotes transparency) and Community Service or “Good Will” Projects (company’s website, to promote the company’s brand)

Figure 1: The Guild's definition of project ^{8 9}

⁵ Cyberstates (a product by Comptia) – Importance of the tech industry on US soil, and its current trend. Retrieved from: https://www.cyberstates.org/pdf/CompTIA_Cyberstates_2018.pdf

⁶ Comptia (website – January 2018) - *IT Industry Outlook 2018*. Retrieved from: <https://www.comptia.org/resources/it-industry-trends-analysis>

⁷ The Blue Fox Blog (September 2017) - *7 Reasons Why Every Company Needs IT Support*. Retrieved from: <https://www.bluefoxgroup.com/blog/7-reasons-every-company-needs-support>

⁸ BY AUTHOR

⁹ Planning Planet – Definition of Portfolio, Project and Assets. Retrieved from: www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls

Program	Strategic Program	Set of related projects, combined with the purpose to attain the sponsor's future state. This program is linked to a specific strategic goal and its early results influence the further decision-making process	Choosing to launch an IT project is often a strategic decision, especially when the IT dimension of a company is modernized. The most significant example is the case of Levi-Strauss, where a project which originally should have cost 5 million dollars cost over 200 million dollars.
	Operational Program	Interdependent constituent projects, aiming to affect sponsor's day-to-day operations	IT projects are led inside all international companies, such as banks, who need IT for both employees and clients.
	Multi-Project Program	Created interdependence of constituent project in order receive benefits from the synergy	IT projects are often interconnected with projects from either the IT field, or fields that have no link with IT at all. This is for example the case with CAE projects, in which computer engineers work directly with mechanics or construction professionals.
	Mega-Project	Project with significantly larger scale than the typical sponsor's projects have.	Some IT projects have a significant size. The biggest failures are even said to have exceed 20 billion dollars losses

Figure 2: The Guild's Definition of a Program¹⁰

¹⁰ BY AUTHOR

Portfolio	Portfolio of Projects	Is investment portfolio, where the main aim is to minimize risks and maximize returns.	An IT Project is always led inside a company, the main goal of which is to be competitive on the market and sell its products. The company's projects will be regrouped inside a portfolio, which will enable the board to take the decision to launch only the projects which are the most likely to succeed and will bring the biggest benefits to the company.
	Portfolio of Assets	Owner or Contractor has a portfolio of assets, that mean set of resources, which are dedicated to the projects, with the aim to generate those resources into the most desirable return.	

Figure 3: The Guild's Definition of portfolio^{11 12 13}

The IT assets can be divided into the five themes defined in the Guild ¹⁴.

Information Assets	Database, Lessons learned, Documentation
Human Assets	Computer Engineer, Tester, Project Manager...
Physical Assets	Computers, State of the art devices
Financial Assets	Invested Capital
Intangible Assets	Patents

Figure 4: Assets of IT projects

Since most companies need IT, because otherwise they would be put at a disadvantage with their competitors, the success of IT projects really matters. But IT projects have a strong failure rate, with “only 29% of IT project implementations” succeeding. 19 percent of project’s failure are even described as being an “utter failure”¹⁵. The PMI defines 6 factors that are required, for

¹¹ BY AUTHOR

¹² Planning planet (2015, November 2). GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR).

¹³ Bent Flyvbjerg and Alexander Budzier (September 2011) - *Why Your IT Project May Be Riskier Than You Think*. Retrieved from: <https://hbr.org/2011/09/why-your-it-project-may-be-riskier-than-you-think>

¹⁴ Planning planet (2015, November 2). GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR)

¹⁵ Nick Ismail (February 2018) - *Why IT projects continue to fail at an alarming rate*. Retrieved from: <https://www.information-age.com/projects-continue-fail-alarming-rate-123470803/>

a project to be considered as successful, such as the on-time delivery and the respect of the project’s budget¹⁶.

One example perfectly illustrates the difficulties of leading a successful project. Levi-Strauss, a major clothing company which operates in over 100 countries, decided at the beginning of the 21st century to restructure its whole IT network, to improve its existing system from “a balkanized mix of incompatible country-specific computer systems”¹⁷ to a single SAP system for the whole company. The project seemed rather easy at first sight, but things became complicated, resulting in all three of its U.S. distribution centres being closed for a week. When the project ended, a \$5 million project resulted in a \$200 million loss.

Thus, increasing the chances of success for a project requires to understand the leading causes of failure, as well as the different possible ways that could be implemented to solve these issues. As in any other kind of project, the classical methods can be applied to solve disputes, that is litigation, arbitration and mediation¹⁸ and to deal with project’s failure, which can be caused by various criteria, such as “shifting project objectives” and “inaccurate requirements”¹⁹. The fishbone diagram below will illustrate these major failure causes.

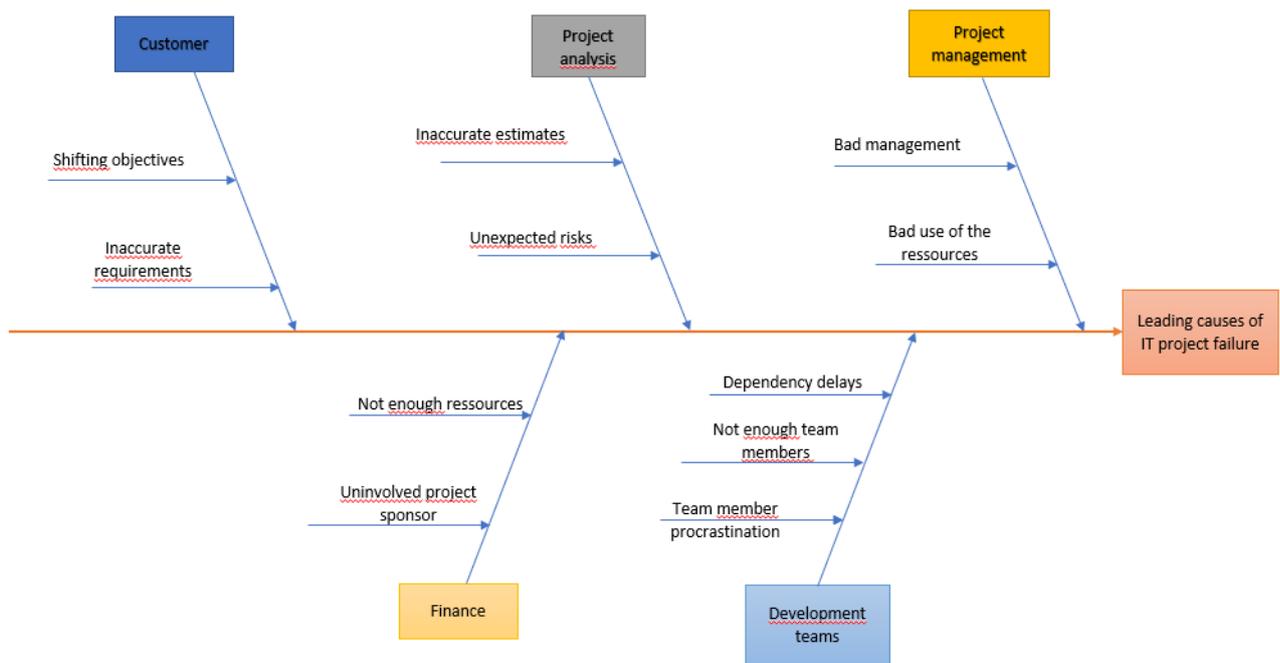


Figure 5: Root Cause Analysis²⁰

¹⁶ Jessica Greene (2018) - *The Top 9 Reasons for IT Project Failure: Is Your Project at Risk?* Retrieved from: <https://www.askspoke.com/blog/it/reasons-for-it-project-failure/>

¹⁷ Bent Flyvbjerg and Alexander Budzier (September 2011) - *Why Your IT Project May Be Riskier Than You Think*. Retrieved from: <https://hbr.org/2011/09/why-your-it-project-may-be-riskier-than-you-think>

¹⁸ Triinu Hiob and Katrin Sarap (January 2018) - *3 different ways of solving business disputes – which one to choose?* Retrieved from: <https://www.njordlaw.com/different-ways-dispute-resolution-whats-difference/>

¹⁹ Jessica Greene (2018) - *The Top 9 Reasons for IT Project Failure: Is Your Project at Risk?* Retrieved from: <https://www.askspoke.com/blog/it/reasons-for-it-project-failure/>

²⁰ BY AUTHOR

Thus, the main goal of this paper is to understand the principal causes of failure in IT contracts, and to figure out how an IT project should be conducted to end up successful. Since being able to use state-of-the-art technologies is nowadays a requirement for most companies, reducing the risks and costs linked with IT projects has become a thorny issue. Indeed, IT projects are amongst the projects which shape our world, due to their tremendous impact on our way of life. Yet they remain very risky, as a high percentage of IT projects fail because of numerous criteria, such as inaccurate estimates or requirements, objectives shifting over time or limited resources²¹. But before moving further, we should differentiate project success and success of the product project. Success of the product project is achieved when the product is delivered to the customer and meets the technical requirements. Project success depends on the point of view we use. Traditionally, project success was achieved when a project respected the 3 elements of the Iron Triangle (Cost, Time and Quality), but studies have proved that project success can't be reduced to these three criteria, and could include, amongst other things, economic, social or sustainable criteria²². As showed on the table below, a project can then succeed while its product fails (or the other way around):²³

		PRODUCT of the Project	
		Succeeds	Fails
PROJECT	Succeeds	Project Succeeds Product of the Project Succeeds	Project Succeeds Product of the Project Fails
	Fails	Project Fails Product of the Project Succeeds	Project Fails Product of the Project Fails

Figure 6 - The Difference between PROJECT success and PRODUCT success
 Source: Giammalvo, Paul D (2015) Course Materials. Contributed Under Creative Commons License BY v 4.0

By the end of this paper, I will show how using a multi-dimensional Work Breakdown Structure (WBS) can increase the chances of success of an IT project. A Work Breakdown Structure can be defined as “A tool for defining the hierarchical breakdown of work required to deliver the

²¹ Jessica Greene (2018) - *The Top 9 Reasons for IT Project Failure: Is Your Project at Risk?* Retrieved from: <https://www.askspoke.com/blog/it/reasons-for-it-project-failure/>

²² Zoltan Sebestyen (June 2017) – *Further Considerations in Project Success*. Retrieved from: <https://reader.elsevier.com/reader/sd/pii/S1877705817331545?token=AC154FC01D9675DB946D1B609D1726CE15AFAE27D13D3488AEB3A40441C4AE3AB606ABB2FE180C4F46918E301C3B3438>

²³ Glenn Butts – About the root cause problem of Projects. Retrieved from: http://www.build-project-management-competency.com/wp-content/uploads/2010/09/Glenn_Butts-Mega-Projects-Estimates.pdf

products of a project. Major categories are broken down into smaller components. These are sub-divided until the lowest required level of detail is established. The lowest units of the WBS become the activities in a project. The WBS defines the total work to be undertaken on the project and provides a structure for all project control systems."²⁴

METHODOLOGY

Step 1: Stated Problem

- How to lead a successful IT project and reduce the risks of failure?
- How can a WBS be used to increase the chances a project has to succeed?

Step 2: Feasible Alternatives

Several solutions exist to deal with project failure, most of which are already widely used in projects for other industries.

Below are the different alternatives which might be implemented during an IT project, to increase the chances of success of said project:

1. Use of a flat WBS

Using a WBS as soon as the project's deliverables and scopes have been defined is often recommended. Indeed "it is very important to break down the project's work into smaller work elements"²⁵. Transforming the whole project into small tasks that can be executed by just one employee is often recognized as a good strategy, since it is way more manageable for the Project Manager, to see the advancement of small elements. We must however notice the differences in two WBS made by two different managers, some being too detailed, and the others not detailed enough. Thus, "the WBS should be produced with sufficient detail to serve as a helpful tool in managing the project's tasks"²⁶. The WBS should also contain "all the deliverables connected with the project.". IT Managers often use flat WBS Structures, yet the main problem coming alongside this method is that it doesn't enable to see the situation from different perspectives. For instance, using an Activities Breakdown Structure (ABS) by products "doesn't give a comprehensive image by releases" and are "difficult for resources assignment"²⁷. It also

²⁴ Max Wideman (2017) – *Wideman Comparative Glossary of Project Management Terms v5.5*. Retrieved from: http://www.maxwideman.com/pmglossary/PMG_W00.htm#Work%20Breakdown%20Structure

²⁵ Project-Management.com (October 2018) – *Work Breakdown Structure for IT Projects (WBS)*. Retrieved from: <https://project-management.com/work-breakdown-structure-for-it-projects-wbs/>

²⁶ Eric Shaw (April 2011) - *Standardizing Work Breakdown Structures*. Retrieved from: <https://www.projectsmart.co.uk/forums/viewtopic.php?t=857>

²⁷ Asma AlFadha (November 2014) – *Can Multidimensional WBS be the Solution for IT Project Issues ?* Retrieved from: <https://pmworldjournal.net/wp-content/uploads/2014/11/pmwj28-nov2014-AlFadha-multidimensional-wbs-Featured-Paper2.pdf>

only enables to deal with the first root cause from Rand Study, while doing little or nothing to deal with the other two. Even though it isn't a new method, we will keep it for the next steps, as it is the most widely used by managers, and will enable us to compare the possible improvements with the solution currently in place.

2. Use of a multi-dimensional WBS

Using a 3 Dimension WBS is a way to combine several types of Breakdown Structures. Most projects suffer from inaccurate or overoptimistic estimations, as well as omitting probable scope and estimates, as showed by Rand Study²⁸. 3D WBS enable to overcome these issues by combining several types of Breakdown Structures, such as the Product Breakdown Structure (PBS), the Activities Breakdown Structure (ABS) and the Zone Breakdown Structure (ZBS). These multidimensional models will "link information together and facilitate reporting", while bringing several phases and aspects of the project together²⁹. We can also note that such a structure can be extended to up to 8 dimensions, if need be, depending on the project's size and complexity.

3. Choosing Agile management

Choosing Agile management for a project increases the chances of success of said project. Over the last few years, there has been an increase in the number of companies which used Agile Management for some or most of its IT projects. Yet numerous experts from the it field distrust this management method, and consider it isn't rigorous enough. The main advantage of using Agile Management inside a project is that these methodologies are "not bound by the strictures of the traditional certifications and training project managers used to use"³⁰. Agile Management can be described as "the ability to successfully sell low-cost, high-quality products with short delivery times and in different capacities that by the adaptation to the needs of the user provide increased value for customers"³¹.

4. Using ITG Standards and Practices

IT projects are often valuable opportunities, but they remain extremely risky. This is the reason why Information Technology Governance (ITG) was invented. This way of governance was

²⁸ Glenn Butts – About the root cause problem of Projects. Retrieved from: http://www.build-project-management-competency.com/wp-content/uploads/2010/09/Glenn_Butts-Mega-Projects-Estimates.pdf

²⁹ Asma AlFadha (November 2014) – *Can Multidimensional WBS be the Solution for IT Project Issues ?* Retrieved from: <https://pmworldjournal.net/wp-content/uploads/2014/11/pmwj28-nov2014-AlFadha-multidimensional-wbs-Featured-Paper2.pdf>

³⁰ Sharon Florentine (February 2017) - *IT project success rates finally improving*. Retrieved from: <https://www.cio.com/article/3174516/project-management/it-project-success-rates-finally-improving.html>

³¹ Patřicia Frankov, Martina Drahořov, Peter Balco (2016) – *Agile project management approach and its use in big data management*. Retrieved from: https://ac.els-cdn.com/S1877050916303052/1-s2.0-S1877050916303052-main.pdf?_tid=922b57e8-94c8-47ec-9abb-0406d86341a3&acdnat=1544391818_9ebe7b4d4c729ff98f14b63d534e9404

primarily based on the way corporations were managed, so it was adapted to fit the needs of IT projects. ITG can be described as “primarily responsible for optimizing the use of IT resources and managing the risks of IT projects and practices”. Since poor risk management and bad assumption of the resources needed for the project are two of the most significant criteria for project failure, this solution was designed to avoid these issues. The standards and practices recommended on ITG are mostly based on five principles which are “Meeting stakeholder needs, covering the enterprise end-to-end, applying a single integrated framework, enabling a holistic approach and separating governance from management”.³²

In order to be able to classify the different alternatives, a multi-attribute decision model will be used. But before moving to the next step, we should define what Project Success Criteria (PSC) and Critical Success Factors (CSF) are. PSC are attributes while will be “used to measure project success”³³, whereas the CSF were defined in 1979 by Rockart as “the few key areas that must go right for the business to flourish”³⁴. The criteria below, which belong to one of these categories, will enable to rank the possible solutions, to figure out which one is the best:

1. **Cost (PSC):** how much the project will cost to the company, in comparison with what it is expected to cost. The Levi-Strauss case exemplifies the fact that managing badly an IT project can have a huge cost on the company and can even be 20 times higher than what it was primarily supposed to be³⁵. It is one of the so-called “Iron Triangle” Criteria, alongside with time and quality.³⁶
2. **Time (PSC):** the different steps of the project can be delivered on time, so that the final product isn’t delayed. It is commonly acknowledged that “Project management success is often determined by whether or not you kept to the original timeline”³⁷. This is another of the “Iron Triangle” criteria, which were used to assess project success from a Business point of view.³⁸

³² Zyad Alreemy, Victor Chang, Robert Walters, Gary Wills – *Critical Success Factors (CSFs) for Information Technology Governance (ITG)*. Retrieved from: <https://core.ac.uk/download/pdf/46576542.pdf>

³³ Jorge Gomes, Mario Romão (October 2016) – *Improving project success: A case study using benefits and project management*. Retrieved from: https://ac.els-cdn.com/S1877050916323559/1-s2.0-S1877050916323559-main.pdf?_tid=53b4d9a3-e1d2-4cc4-b87a-547981904f44&acdnt=1544386624_97a9642e87bc4bcd23f8a381ce4a78ff

³⁴ Zyad Alreemy, Victor Chang, Robert Walters, Gary Wills – *Critical Success Factors (CSFs) for Information Technology Governance (ITG)*. Retrieved from: <https://core.ac.uk/download/pdf/46576542.pdf>

³⁵ Bent Flyvbjerg and Alexander Budzier (September 2011) - *Why Your IT Project May Be Riskier Than You Think*. Retrieved from: <https://hbr.org/2011/09/why-your-it-project-may-be-riskier-than-you-think>

³⁶ João Varajão, Luis Magalhães, Luis Freitas, Pedro Ribeiro, João Ramos (2018) – *Implementing Success Management in an IT project*. Retrieved from: <https://reader.elsevier.com/reader/sd/pii/S1877050918317630?token=702ED1BE30FD1F16BD82B15A7FECC59E6607AE46595B56C86833EE06490A35ADB75F3587D9746AE8639EBEA29976675>

³⁷ Jason Westland (September 2015) – *5 Ways To Measure Project Success*. Retrieved from: <https://www.projectmanager.com/blog/5-ways-to-measure-project-success>

³⁸ João Varajão, Luis Magalhães, Luis Freitas, Pedro Ribeiro, João Ramos (2018) – *Implementing Success Management in an IT project*. Retrieved from:

3. **Scope Control (CSF):** this attribute aims at discovering what the aim of a project is, which means understanding “the intended result of a project” and finding out “what is required to bring it to completion”³⁹. The scope will then enable to assess what the objectives of the project are, and how they will be achieved. Neglecting this factor might have undesired consequences on the other attributes, as “Unexpected outcomes due to difficulty in stabilizing and defining the scope originated greater expenditure and time consumption than initially forecasted”⁴⁰.
4. **Customer Satisfaction (PSC):** This criteria assesses to what extent the client is satisfied with the product delivered and how it meets the requirements defined in the early stages of the project. It also includes “taking the project into use” and the “monetary savings from using the results”⁴¹.
5. **Quality/Technical Requirements (PSC):** When conducting a project, quality is a key factor which will determine whether the deliverable meets the minimum technical requirements. Quality can be described as “what the customer or stakeholder needs from the project deliverables”⁴². This is the last criteria of the Iron Triangle.
6. **Objectives Achievement (PSC):** this attribute assesses whether the project achieves objectives, on different levels. Objectives can be related to the project itself, to the program, or even to the organization. Having project objectives which are aligned with the company’s objectives will enable the team leader and the project management to manage the project more efficiently. In fact, “it is a pre-requisite for an efficient implementation that the organization knows the objectives of the organization and the project”⁴³. To assess whether the project’s objectives have been achieved or not

<https://reader.elsevier.com/reader/sd/pii/S1877050918317630?token=702ED1BE30FD1F16BD82B15A7FECC59E6607AE46595B56C86833EE06490A35ADB75F3587D9746AE8639E8EA29976675>

³⁹ Diana Eskander (October 2018) – *6 Ways of Measuring Project Success*. Retrieved from: <https://project-management.com/6-ways-of-measuring-project-success/>

⁴⁰ Jorge Gomes, Mario Romão (October 2016) – *Improving project success: A case study using benefits and project management*. Retrieved from: https://ac.els-cdn.com/S1877050916323559/1-s2.0-S1877050916323559-main.pdf?_tid=53b4d9a3-e1d2-4cc4-b87a-547981904f44&acdnat=1544386624_97a9642e87bc4bcd23f8a381ce4a78ff

⁴¹ Jari Vanhanen, Timo O.A. Lehtinen, Casper Lassenius (2018) – *Software engineering problems and their relationship to perceived learning and customer satisfaction on a software capstone project*. Retrieved from: <https://reader.elsevier.com/reader/sd/pii/S0164121217302716?token=0763216227A22DF2B7F89E2D2D5FE6CC3C6484B0EFFF77C69614368F90D31533189CFC1469E0838B7DC35331AD2DAE99A>

⁴² Stephanie Ray (May 2018) – *Project Quality Management – A Quick Guide*. Retrieved from: <https://www.projectmanager.com/blog/project-quality-management-quick-guide>

⁴³ Jacob Thaning (January 2012) – *Top 10 Key Attributes of a Successful IT Project*. Retrieved from : <https://fr.slideshare.net/arjencornelisse/top10-key-attributes-for-a-successful-project>

throughout the project, the company will compare the results obtained at the end of the project, with success criteria which were defined in the early stages of the project⁴⁴.

7. **Risk/Opportunities Management (CSC):** According to Butt's analysis, risk is number 2 in terms of project's failure. Thus, being able to manage risk in a project is necessary, in order to avoid losing time and spending too much money. Risk identification is one of the first steps when launching a project, and studies have proved that the product performance will be significantly improved by an accurate risk identification and response planning. Risk Management can even be described as "the highest influence on all IT projects success"⁴⁵.
8. **Resource Availability (CSC):** Projects have limited resources to achieve results in a short time. For IT projects, which are renowned to be extremely expensive, the resources available play a huge role in whether the project will be achievable or not. Using the right resources at the right time and for the right thing, can often make the difference between success and failure. Since there are too many Success Factors in a project to be able to spend money on all of them, choices have to be made, so managing the resources available in a project is really important. Indeed, "Committing resources based on the large number of success variables is neither feasible nor advisable"⁴⁶.
9. **Top Management Support (CSC):** The "Top Management" expression addresses to the members of the board of directors who have first-hand responsibilities in the project, such as being responsible for the risk management, using wisely the resources, creating a positive risk management culture... Top management support has been supported by several scholars, including Barton in 2002 and Kleffner in 2003. They assessed that there is a link between the level of Employee Relationship Management (ERM) implementation in a project, and the strength of top management project in said

⁴⁴ Jorge Gomes, Mario Romão (October 2016) – *Improving project success: A case study using benefits and project management*. Retrieved from: https://ac.els-cdn.com/S1877050916323559/1-s2.0-S1877050916323559-main.pdf?_tid=53b4d9a3-e1d2-4cc4-b87a-547981904f44&acdnat=1544386624_97a9642e87bc4bcd23f8a381ce4a78ff

⁴⁵ Daranee Pimchangthong, Veera Boonjing (2017) – *Effects of Risk Management Practice on the Success of IT Project*. Retrieved from: https://ac.els-cdn.com/S1877705817312948/1-s2.0-S1877705817312948-main.pdf?_tid=3a08e06c-1c69-4615-aab3-f47df7e567be&acdnat=1544385437_1e0f00b98e28c99e0898eae6c0b49bc6

⁴⁶ Debadyuti Das, Christopher Ngacho (November 2017) – *Critical success factors influencing the performance of development projects: An empirical study of Constituency Development Fund projects in Kenya*. Retrieved from: <https://reader.elsevier.com/reader/sd/pii/S097038961730561X?token=CF9D4600FD2DB4EBE02B03EB4EA94A4E2FC4A30B192BD213F053660530BF3A190A05CA39F55EB666EBC094E29F3BEB86>

support⁴⁷. A strong Top Management Support will then contribute in strengthening the team’s motivation, as well as the involvement of the team members⁴⁸.

Step 3: Development of outcomes

Now that we have listed the 9 attributes above, which we consider to be the 9 main attributes for project success, we have to rank them by order of importance.

For this step, we will use the **non-compensatory model** below, which will enable to rank all the attributes by comparing each attribute with all the other attributes. This methodology consists in “tak[ing] a look at all the attributes and conduct[ing] a Pair-Wise comparison to determine which attributes are the most important by asking “which is more important?” and give a score of 1 to the winning option and a score of 0 to the losing option”⁴⁹.

	Cost	Time	Scope Control	Customer Satisfaction	Quality/Technical Requirements	Objectives Achievement	Risk/Opportunities Management	Resource Availability	Top Management Support	Ordinal Ranking
Cost	1	1	1	1	1	1	1	1	1	8
Time	0	1	1	1	0	1	1	1	1	6
Scope Control	0	0	1	0	0	0	0	0	0	0
Customer Satisfaction	0	0	1	1	0	1	0	1	1	4
Quality/Technical Requirements	0	1	1	1	1	1	1	1	1	7
Objectives Achievement	0	0	1	0	0	1	0	0	0	1
Risk/Opportunities Management	0	0	1	1	0	1	1	1	1	5
Resource Availability	0	0	1	0	0	1	0	1	1	3
Top Management Support	0	0	1	0	0	1	0	0	1	2

Figure 6: Disjunctive Reasoning Method on the attributes⁵⁰

⁴⁷ Ishaya John Dabari, Siti Zabedah Saidin (August 2014) – A theoretical framework on the level of risk management implementation in the Nigerian banking sector: The moderating effect of top management support. Retrieved from:

https://ac.els-cdn.com/S187704281405976X/1-s2.0-S187704281405976X-main.pdf?_tid=b2b6eb66-7a7a-40b6-b4f3-0b3f26558108&acdnt=1544452620_4e40d10eac54a62f1980d034e9781c61

⁴⁸ Jorge Gomes, Mario Romão (October 2016) – Improving project success: A case study using benefits and project management. Retrieved from: https://ac.els-cdn.com/S1877050916323559/1-s2.0-S1877050916323559-main.pdf?_tid=53b4d9a3-e1d2-4cc4-b87a-547981904f44&acdnt=1544386624_97a9642e87bc4bcd23f8a381ce4a78ff

⁴⁹ Sullivan, Wickes & Kroelling (2014) *Engineering Economics* 15th Edition Using the approach. Retrieved from: <http://www.planningplanet.com/guild/gpccar/managing-change-the-owners-perspective>

⁵⁰ BY AUTHOR

Thanks to this method, we can now rank the attributes from the most important to the least important:

1. Cost
2. Quality/Technical Requirements
3. Time
4. Risk/Opportunities Management
5. Customer Satisfaction
6. Resource Availability
7. Top Management Support
8. Objectives Achievement
9. Scope Control

Step 4: Selection of a criterion

Using a **multi-attribute decision making model**, we will weigh the advantages and disadvantages of all the alternatives and check their compatibility with the different attributes, to eliminate those which do not fulfill the requirements⁵¹. Several colors are used inside the model (green meaning the solution is good for the attribute, yellow when it is average and red when the solution clearly is bad).

	Use of a flat WBS	Use of a multi-dimensional WBS	Agile Management	Using ITG Standards and Practises
Cost	Low	Low	Average	Average
Time	Good	Excellent	Excellent	Average
Scope Control	Good	Excellent	Good	Good
Customer Satisfaction	Average	Excellent	Good	Good
Quality / Technical Requirements	Excellent	Excellent	Average	Average
Objective Achievements	Average	Excellent	Good	Excellent
Risk/Opportunities Management	Bad	Excellent	Good	Average
Resource Availability	Bad	Good	Good	Average
Top Management Support	Average	Average	Good	Low

Figure 7: Dominance technique⁵²

⁵¹ Sullivan, Wickes & Kroelling (2014) - *Engineering Economics*. Retrieved from: <http://www.planningplanet.com/guild/gpccar/managing-change-the-owners-perspective>

⁵² BY AUTHOR

We then weigh each attribute, so that we can compare all the solutions

	Use of a flat WBS	Use of a multi-dimensional WBS	Agile Management	Using ITG Standards and Practises
Cost	1	1	0,5	0,5
Time	0,75	1	1	0,5
Scope Control	0,75	1	0,75	0,75
Customer Satisfaction	0,5	1	0,75	0,75
Quality / Technical Requirements	1	1	0,5	0,5
Objective Achievements	0,5	1	0,75	1
Risk/Opportunities Management	0	1	0,75	0,5
Resource Availability	0	0,75	0,75	0,5
Top Management Support	0,5	0,5	0,75	0
Totals	5	8,25	6,5	5

Figure 8: Dominance Technique ranking of the strategies⁵³

This second technique enable us to determine the minimum acceptable for an alternative to be kept.

The diagram above enables to start taking some solutions out the picture. After studying the tabs, we decided that only the alternatives with a total strictly above 5 will be kept as a fit option. We can then eliminate two alternatives, which are the **use of a flat WBS** and **using ITG standards and practises**.

Thus, only the best solutions, **the use of a multi-dimensional WBS** and the **extensive use of Agile Management** inside the company, will remain for the next steps.

FINDINGS

Step 5: Analysis and Comparison of the alternatives

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In Step 5, we will summarize the whole decision-making process, which we initiated in steps 3 and 4, thanks to an **additive weighting technique**⁵⁴. This ranking technique will enable us to rank the different alternatives while taking the weight of the attributes into account. In the previous steps, we eliminated two alternatives, the use of a flat WBS and using ITG standards and practices, which means that only the two remaining alternatives will appear in the table, namely the **use of a multi-dimensional WBS** and the **extensive use of Agile Management**.

	Step 1	Step 2	Use of a multi-dimensional WBS		Use of Agile Management	
	Relative ranking	Normalized weight (A)	(B)	(A)*(B)	(C)	(A)*(C)
Cost	9	0,2	1	0,2	0,5	0,1
Quality/Technical Requirements	8	0,18	1	0,18	0,5	0,09
Time	7	0,16	1	0,16	1	0,16
Risk/Opportunities Management	6	0,13	1	0,13	0,75	0,0975
Customer Satisfaction	5	0,11	1	0,11	0,75	0,0825
Resource Availability	4	0,09	0,75	0,0675	0,75	0,0675
Top Management Support	3	0,07	0,5	0,035	0,75	0,0525
Objectives Achievement	2	0,04	1	0,04	0,75	0,03
Scope Control	1	0,02	1	0,02	0,75	0,015
SUM	45	1,00	SUM	0,94	SUM	0,70

Figure 9: Additive Weighting Technique⁵⁵

Using this methodology has confirmed the results that we’ve obtained during step 4. The best alternative for a company to lead a successful IT project is to use a multi-dimensional WBS, this solution scoring much higher than the other remaining option.

Step 6: Selection of the preferred alternative

⁵⁴ Sullivan, Wickes & Kroelling (2014) - *Engineering Economics* 15th. Adaptation from planning planet. Retrieved from: <http://www.planningplanet.com/guild/gpccar/managing-change-the-owners-perspective>

⁵⁵ BY AUTHOR

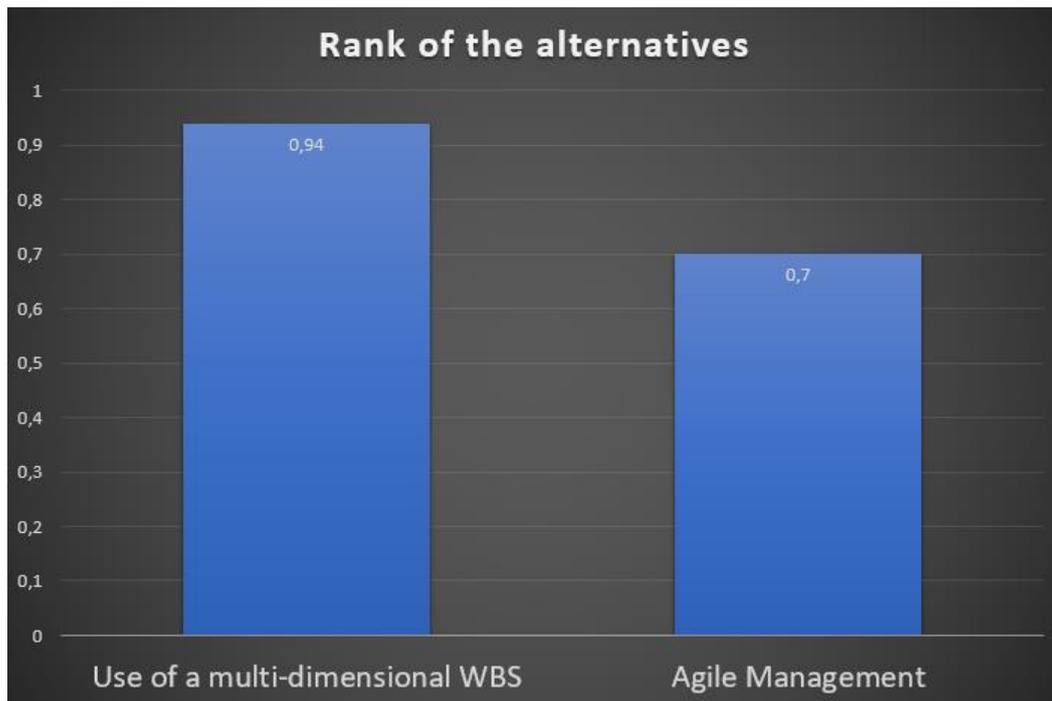


Figure 10: Rank Graph of the Alternatives⁵⁶

The graph above illustrates the fact that the best alternative by far is the **use of a multi-dimensional WBS**, even though **Agile Management** remains a fairly good option, with a score of 0,7.

The **use of a multi-dimensional WBS** is also a better choice by 165% in comparison with **the use of a flat WBS** and the **use of ITG Standards and Practices** ($8,25/(5*100)$ in both cases).

« A 3D WBS combines activities, zones and products so standardization can be generated from activities vs. products for any product line »⁵⁷. Amongst the main advantages offered by 3D-WBS, are the excellent level of detail that they offer to the project management. They are also sometimes qualified as comprehensive, since they cover almost all the aspects of the project structures. It is also easier to prepare progress reports. But their main advantage lies within the fact that they are optimal for all kinds of estimates, including cost estimates, and make it easier to identify risks and make contingency plans for these risks. They will then enable to estimate way more precisely the project, in terms of cost, time and quality. Since bad and unrealistic estimates are two of the three main causes of project failure, alongside with poor risk management, according to the Rand Study, this method will prevent the three main causes of

⁵⁶ BY AUTHOR

⁵⁷ Asma AlFadha (November 2014) – *Can Multidimensional WBS be the Solution for IT Project Issues?* Retrieved from: <https://pmworldjournal.net/wp-content/uploads/2014/11/pmwj28-nov2014-AlFadha-multidimensional-wbs-Featured-Paper2.pdf>

project failure. Thus, choosing a multidimensional WBS will keep the main issues that projects encounter at bay, and will strengthen the chances of success of this project⁵⁸.

Step 7: Performance monitoring and post-evaluation of results

The sixth step highlighted the fact that the best alternative is the use of a multi-dimensional WBS and exposed the reasons why it is a better option than the other ones. In the seventh step, we will find out how the impact of this solution can be measured by a company which decides to use it.

During the first step, we explained that the main goal of this paper was to explain how to increase the success rates of projects. Thus, the first indicator of the efficiency of multi-dimensional WBS is the **number of successful projects led by a company over a given period of time**.

However, we will analyse a step further and assume that one significant project failed, and assess the impact that this failure had on the company.

The tool we will use to do so is a Pareto analysis. "A Pareto analysis helps prioritize decisions so leaders know which ones will have the greatest influence on their overall goals and which ones will have the least amount of impact."⁵⁹.

We will firstly analyse the consequences on the company without using multidimensional WBS.

⁵⁸ Glenn Butts – *About the root cause problem of Projects*. Retrieved from: http://www.build-project-management-competency.com/wp-content/uploads/2010/09/Glenn_Butts-Mega-Projects-Estimates.pdf

⁵⁹ Chad Brooks (2014, March) - *What Is a Pareto Analysis?* Retrieved from: <https://www.businessnewsdaily.com/6154-Pareto-analysis.html>

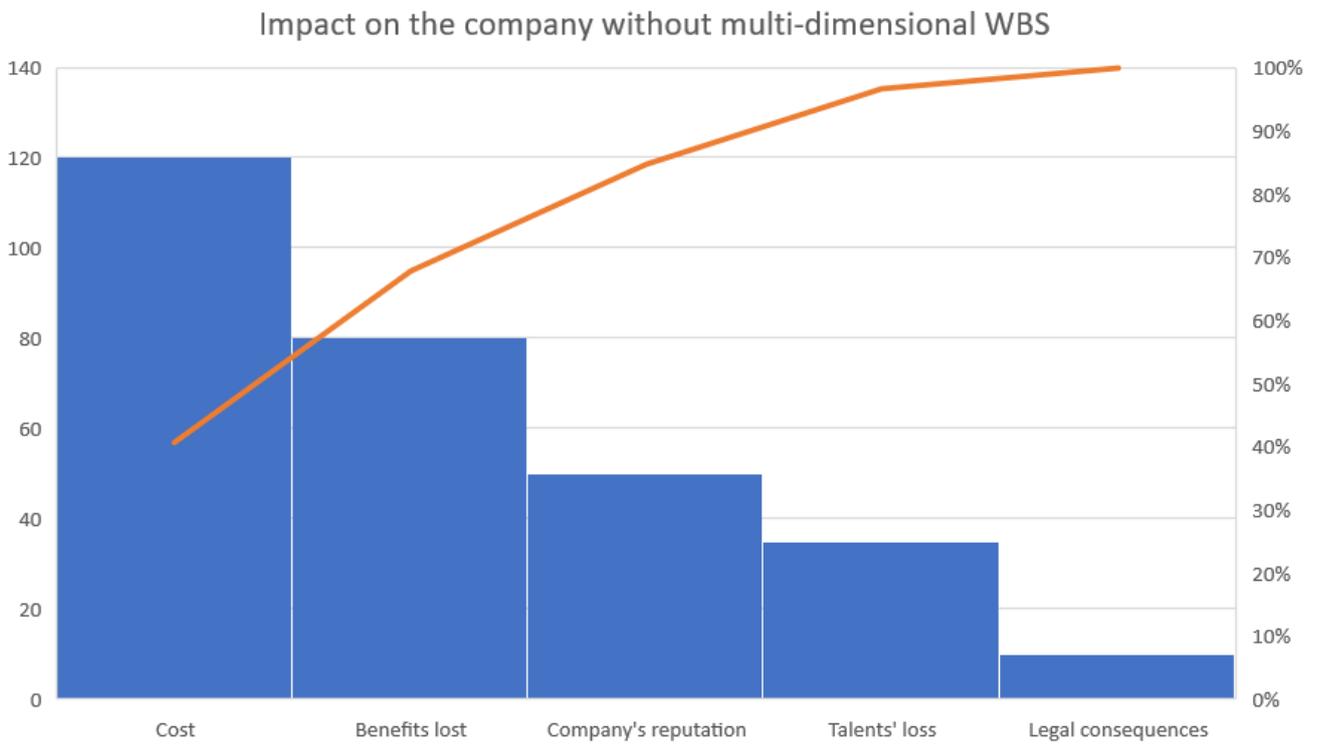


Figure 11: Impact on the company - without multi-dimensional WBS⁶⁰

The graph above illustrates the impact on the company's finances when a significant IT project fails, as it results in increased costs for the project and in benefits losses for the company, when there is no multidimensional-WBS.

⁶⁰ BY AUTHOR

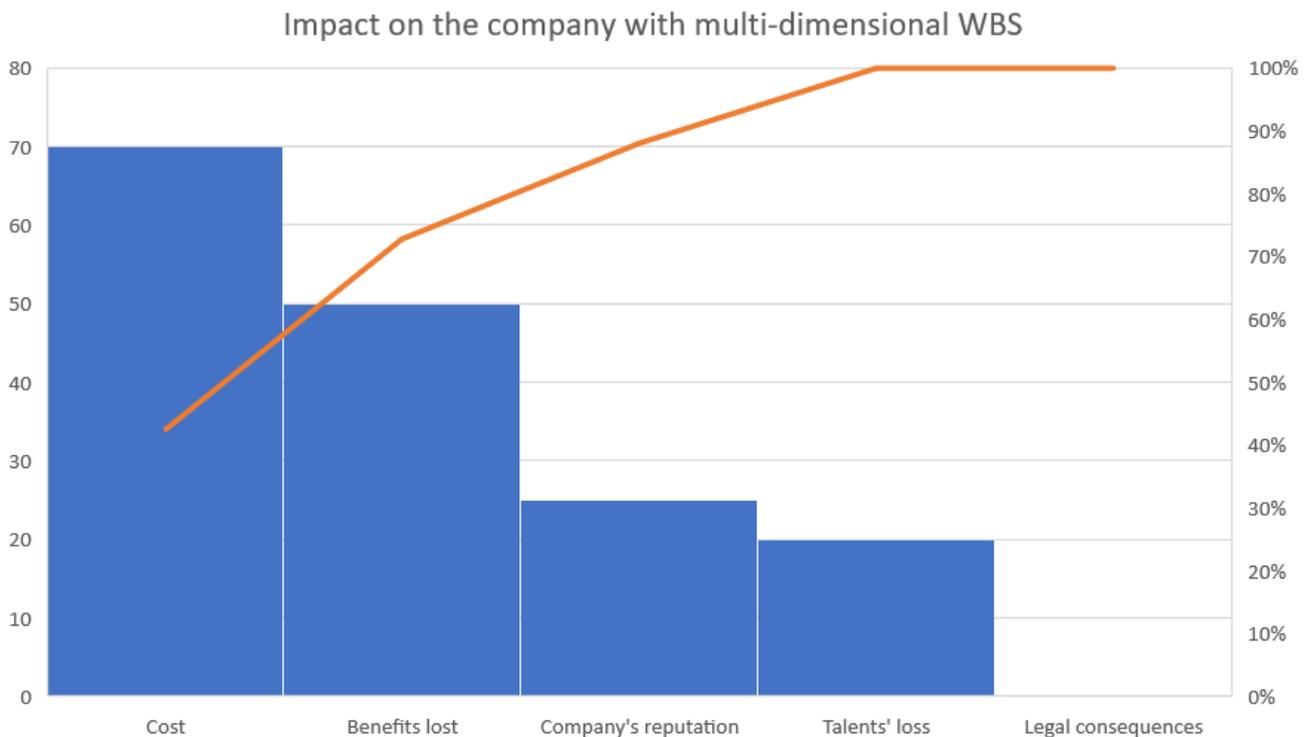


Figure 12: Impact on the company - with multi-dimensional WBS

As we can see on the graph above, the multi-dimensional WBS decreases the possible negative impact a project's failure might have on the company. The 3D-WBS will enable to reduce the impact on the cost of the project, on the benefits lost, on the company's reputation, on the company's ability to retain talented employees, and on the legal consequences the project's failure might have.

CONCLUSION

This paper's initial aim was to find a solution to the high failure rate of IT projects, which have a huge cost on companies. The main problem which was highlighted was the fact that people working in the IT field are reluctant to learn the lessons learned by projects led in projects in different fields, so no standardized solution currently exists for IT projects.

Throughout this paper, we have highlighted the different alternatives to this issue as being the use of a flat WBS, the use of a multi-dimensional WBS, choosing Agile Management, and implementing ITG standards and practices. We have described each option and studied what their impact would be regarding the topic of this paper. The studies then enabled us to take two of these options out: the use of a flat WBS, because it performs poorly in terms of risk management, and the use of ITG standards and principles, as they don't leave room to a good management support.

Once our study was over, we have seen that using multi-dimensional WBS is a really good solution regarding the problem at hands. Using Agile Management alongside this option can be complementary and increase the chances of success of an IT project, although using 3D-WBS is a solution on its own. As we've seen throughout the paper, a project's failure can have tremendous consequences on a company, in terms of cost, talents lost or reputation. Multi-dimensional WBS help reduce these consequences and help safeguard the company.

Nowadays, the trend is to an increase in the rate of project which succeeds. But almost one project out of four is still considered as an utter failure, which means that IT people still have to get rid of their reluctance towards the use of the right tools, which are already used in construction contracts for instance. We may thus wonder what should be done to change the mentalities. Or will practices from other fields be standardized for IT projects and spread widely? Time will tell, even though this paper seems to indicate that the second possibility is the most likely one.

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