

Debunking the Myths - MIT Style is same as the New Jersey Style

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1. Abstract -

Richard Gabriel introduced the concept of New Jersey Style or the “Worse-Is-Better”[1] philosophy in 1991. He argued in favor of the New Jersey Style over the MIT Style - which tries to get simplicity of implementation and interface, correctness, consistency, and completeness of design right. The MIT Style does not tolerate incorrectness at all. The New Jersey Style strives to achieve everything that the MIT Style strives to achieve, except that it is more relaxed in its approach and considers simplicity as the most important consideration. Therefore, if it seems impossible to have both the simplicity of implementation and that of interface, it favors the simplicity of implementation over that of interface. Likewise, it gives higher priority to simplicity over other characteristics - such as consistency, correctness, completeness. However, the compromise is only to a certain extent, not to the full extent - i.e. Simplicity can not completely override any other characteristic, the compromise must be within acceptable levels.

We believe that while it is justified to distinguish the products (software, hardware, and technologies) as being considered of High Quality or of Low Quality, however, the belief that, the MIT Style leads to the creation of High Quality products and that the New Jersey Style leads to the creation of Low Quality products and that both the styles are different, is incorrect. The debate between the MIT Style and the New Jersey Style is a false dichotomy and we prove that both these styles are the same - we then label the same style as the Iterative Model.

When the Iterative Model is followed in a closed-door environment, to the external observers - from whom the inner details of the closed-door environment are concealed, it appears that the MIT Style is being followed inside the closed-door environment. When the Iterative Model is followed in an open environment , where nothing is concealed from the external observers, to the external observers, it appears that the New Jersey Style is being followed.

This paper has 8 sections in all. In Section 2 the intuition behind the main argument is discussed, in Section 3 the main argument is explained in detail. In Section 4, the mathematical proof establishing the equivalence of MIT Style and New Jersey Style is given. Section 5 discusses some common counterclaims and adds few notions to the main argument. Section 6 provides the conclusion and Section 7 acknowledges the inputs from faculty member and Section 8 contains the References.

2. The Intuition Behind The Argument

2.1 Assumptions -

We would like to state certain assumptions -

1. Output - This can be any of the following - software, hardware, research and development's output - research paper, technology, prototype, algorithm, knowledge obtained in the form of findings of the research and development.
2. Team - This refers to the group of people - Scientists, Engineers, UI/UX experts, Architects and relevant personnels of the Computer Science, Engineering and Technology Industry which can "directly" affect the output.
3. Style - The "process" followed to generate the output. For the sake of simplicity, we identify a process by the name of the style that it follows.
4. Specification - A precise statement of the requirement to be fulfilled by the output.
5. Benchmark - A standard or point of reference against which things may be compared or assessed.
6. Benchmark Test - A test which compares the output against along the specifications for each of the benchmarks mentioned.

2.2 Concepts -

MIT Style - The MIT Style supports "the right thing"[1] i.e. all the following characteristics must be "right" - Simplicity, Correctness, Consistency, Completeness. This means that when an output of a process meets "all" the specifications (including all the four characteristics which were mentioned in the previous sentence) as conceived prior to starting the development, then the process which led to such an output is considered as an MIT Style. The MIT Style, in spirit, does not tolerate incorrectness at all in the output - if an output of a process is not "completely correct" i.e. it does not meet "all" the specifications as initially conceived then such a process is "not" MIT Style; for it violates the most fundamental principle of "*complete correctness*" of the MIT Style.

We use the expression "*complete correctness*" to convey that all four characteristics - Simplicity, Correctness, Consistency, Completeness and any other specifications which might be defined by the team are fulfilled completely- with no compromise whatsoever in any of these.

New Jersey Style - The New Jersey Style is more relaxed in its approach towards the output. Even if an output of a process is "*not completely correct*" - i.e. such an output does not meet "all" the specifications as initially conceived then such a "process" is considered as the New Jersey Style. However, for the output to be considered as acceptable, it must pass benchmark tests with deviation from the "required" values as deemed acceptable by the team generating the output. An output which doesn't meet any of the benchmark test and also fails by a large margin on the benchmark tests is likely to be rejected, even by the professors and practitioners of the New Jersey Style.

2.3 Limiting the Scope -

We believe that for a process to be categorized as being an MIT Style or a New Jersey Style, it is mandatory that before the development starts - the specifications, benchmarks and benchmark tests are clearly stated. A process for which this is not possible e.g. open ended research without any concrete specifications or expected targets or outputs, it is impossible to classify such a process as either MIT Style or New Jersey Style.

2.4 The Intuition -

Suppose that Mr X who is a software developer and an ardent follower of the MIT Style starts the development of a software. He starts with well defined specifications, benchmarks and benchmark tests. However, at the end of the development process some of the benchmark tests are not met by the output software. So Mr. X re-works on the developed software and observes improvement in the benchmark test results, yet, they do not meet the specifications as initially conceived. Therefore Mr. X keeps on "*improving*" the software, and eventually is able to successfully produce the "required" software which meets "all" the specifications as initially conceived. Mr. X is then proud of his work and the MIT Style - which he ardently supports -which led to this output.

However, we urge the readers to notice something unusual, even though the above might be the case with several developers who ardently profess and practice the MIT Style, an observation is likely to be overlooked - When Mr. X started the work and when he was still on his way to produce a software which meets all the specifications - Was he following the MIT Style ? Really ? If indeed he was following the MIT Style - then there is clearly a contradiction - The intermediate outputs - which did not meet "all" the specifications as initially conceived, in principle are not the outputs of the MIT Style - for the MIT Style does not tolerate "incorrectness" at all. The final output - the one that meets all the specifications as initially conceived is the "only" output which is worthy of being addressed as an MIT Style output.

The contradiction is that - Mr. X claims that he ardently follows the MIT Style, before he begins the development, and he does end up with an output which meets all the specifications, but what about the intermediate outputs ? How come an ardent supporter of the MIT Style produces intermediate outputs with "incorrectnesses", "inconsistencies" and outputs which do not meet "all" the specifications as initially conceived. These outputs violate the most fundamental spirit of the MIT Style - "complete correctness"

This leads us to a conclusion that Mr. X, during the intermediate outputs/stages - when the output was not "completely correct", was following the New Jersey Style - which is known for producing outputs which are not "completely correct".

Perhaps, the only reasonable conclusion that can be drawn from the above scenario is that -

While Mr. X "thinks" that he professes and practices the MIT Style "consciously", however, in reality he "follows" the New Jersey Style, iteratively, till such point in time when an output is produced - which meets all the specifications and is subsequently "*labeled*" as an MIT Style output by him.

Thus the intuition behind the argument can be stated as -

The professors and practitioners of the MIT Style “think” that they follow the MIT Style consciously, but more often than not, they “unconsciously” practice the New Jersey style. When after several iterations of the New Jersey Style they produce an output which meets the specifications as initially conceived they label the output as an MIT Style output.

However, we would like to strongly emphasize that we believe this happens “inadvertently”.

3. The Argument - MIT Style is same as the New Jersey Style

A fundamental question which, we believe, needs to be addressed is -

“Why is the MIT Style is misconstrued as being “different” than the New Jersey style ?”

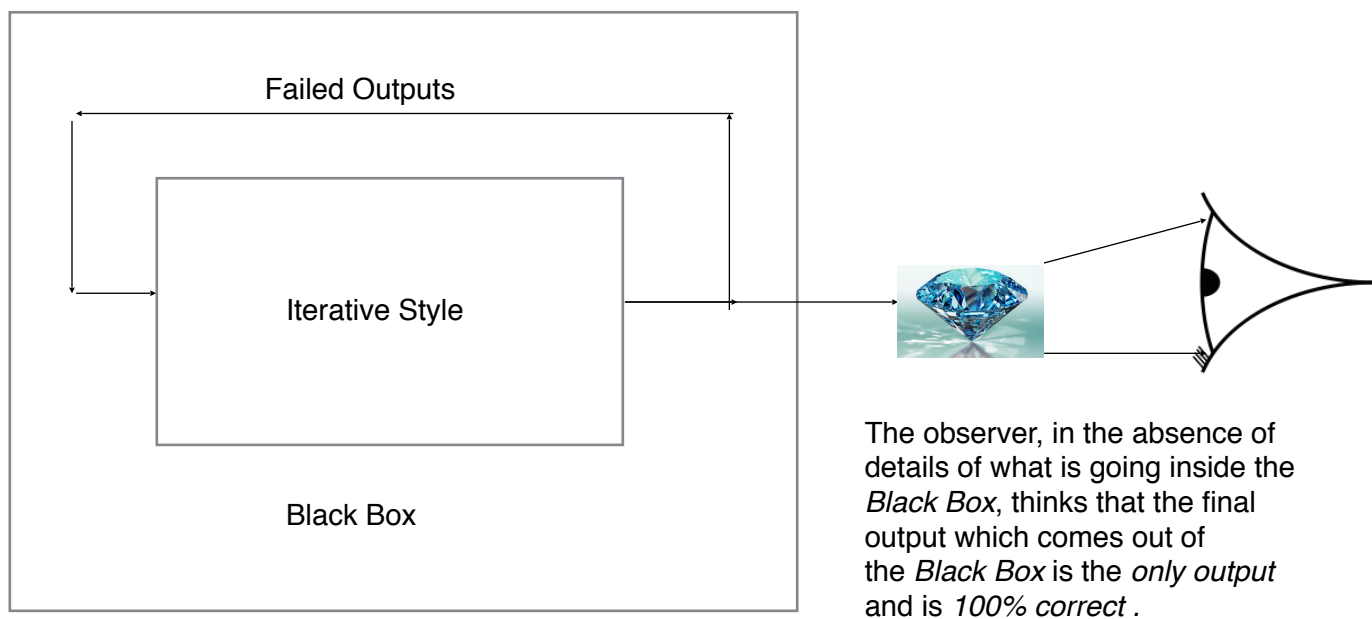


Figure 1 - The *Black Box* conceals the details of the Iterative Model being followed to develop the output. The *Black Box* prevents the external observer from noticing the outputs which were *not* 100% right.

Whereas, in reality, even inside the *Black Box*, there were stages when the output could have been far from 100% correct.

The illusion called the “MIT Style” comes into existence as follows -

1. Some brilliant researchers, engineers and developers, inside the closed-doors of world-class research facilities or universities do research and development. During the research and development they “try to” produce the output as per the initial specifications.
2. These brilliant researchers, engineers and developers, basically, try and try until they succeed. During the stages when they are still trying, they iteratively work upon the previous outputs - which did not meet all the required specifications as initially conceived, till they produce a “successful output” - *an output which meets “all” the specifications as initially conceived.*
3. When they produce a “successful output” - they publish papers about it or generate the required software or hardware.
4. To an external observer, from whom all the activities and details are concealed due to the closed-door environment - which we refer to the “Black Box”, it appears that the researchers/engineers/developers produced *only the “successful output” or the “right output” - as classical MIT Style followers would call it.*
5. The external observer is ignorant of the fact that, the researchers/engineers/developers had to undergo phases of trial-and-error, failed experiments, incomplete or incorrect outputs - basically all such outputs which are “not completely correct” and hence are aptly to be called the *New Jersey Style outputs.*
6. Therefore, we state that the MIT Style can now be defined as follows -

“Follow the New Jersey Style in a Black Box, if required iteratively, till such point in time when a “successful output” - an output which meets all the specifications as initially conceived, is generated. Thereafter, label the “successful output” as an MIT Style output and publish it for the external observers - those people from whom the inner details of the Black Box were concealed.”

We believe that the style being followed, in reality, in the Black Box is the Iterative Style. Where at each iteration evolution takes place. When the above style, iteratively, eventually yields an output which meets “all” the specification as initially conceived, the output is labelled as an MIT Style output and is published for the external observers. In our “opinion” the most appropriate examples of this case would be the products from Apple Inc. and Tesla Motors.

When this style is followed in open, with no Black Box to conceal the activities from the external observers, it is called the plain New Jersey Style e.g. Open Source Softwares. This is because, due to the absence of closed-door environment, the external observers are able to see the “incorrectnesses” of the intermediary outputs.

4. Mathematical Proof

4.1 The Equivalence of the MIT Style and the New Jersey Style

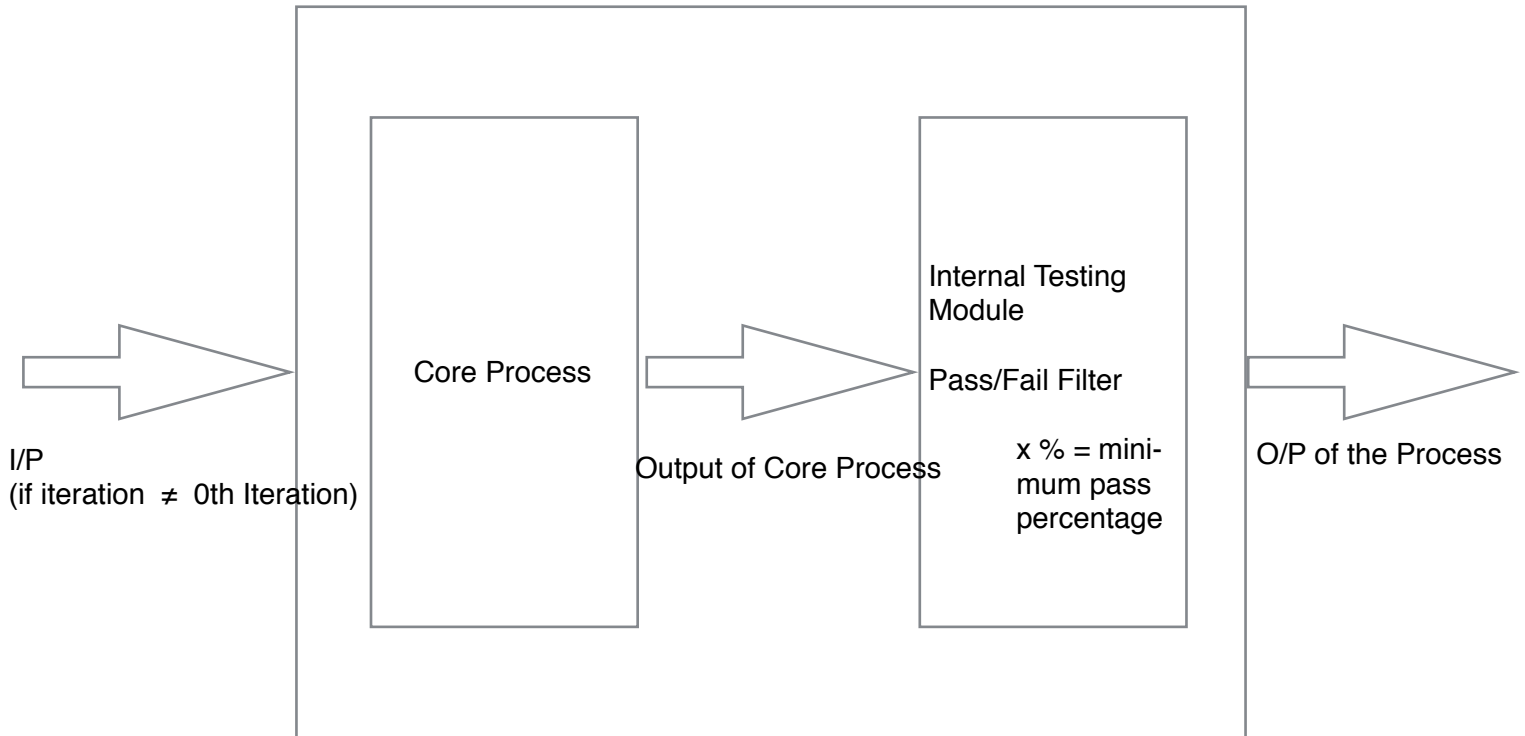


Figure 2. - The schematic diagram of the Iterative Model or the Generic Process

To convey the equivalence of the MIT Style (process) and the New Jersey Style (process), we first construct a formal structure (refer to Figure 2). We, then, explain the details about this formal structure, and subsequently explain how the MIT Style (process) and the New Jersey Style (process) can be expressed in terms of this formal structure - which we call the Iterative Model or Generic Process.

Refer to Figure 2. which provides a schematic of the Iterative Model -

1. *Core Process* - It is responsible for producing the outputs.
2. *Internal Testing Module* - This module accepts the output produced by the Core Process and performs benchmark tests on the output to determine whether the output passes “all” the specifications with “minimum pass percentage” denoted by the “x %”. The “minimum pass percentage” is set by the team involved in (research and/or) development. We would like to highlight that it could be possible that some benchmark tests could be binary tests - pass/fail tests - with no “minimum” percentage. We think such tests can be easily accommodated in

this schematic view with appropriate modifications, without disturbing the high level view of the notion that we present here.

3. If the process is being followed for the first time, then the input is nothing. However, if the process is being followed for the second time/iteration or any iteration other than the first iteration (called 0th Iteration), then the Iterative Model or Generic Process can accept the output produced by the “previous” iteration as its input.

MIT Style -

For the MIT Style the “minimum pass percentage” is 100% - the intuition is that there is no room for incorrectness. The output must be “completely correct”

New Jersey Style -

The New Jersey Style has a “minimum pass percentage” of $x\%$ where $x\% \leq 100\%$. The output can be “up to” 100% correct. The minimum pass percentage can be set at e.g. $x\% = 50\%$ which means that for an output to pass this test, it must meet “at least” 50% of the benchmark test requirement, otherwise it will be rejected as a failed output. As stated previously, the team sets the minimum pass percentage before the process starts.

Quite intuitively, in both MIT Style and New Jersey Style when the output does not meet the minimum pass percentage, the output is “rejected”.

Claim 1 - The set of outputs produced by the MIT Style and the New Jersey Style is the “same” set.

Claim 2 - The MIT Style and the New Jersey Style follow the same process.

Proofs for Claim 1 and Claim 2-

Let M be the set of all the possible outputs of the MIT Style

Let N be the set of all the possible outputs of the New Jersey Style

Using the above schematic diagram, we would like to prove Claim 1 and Claim 2-

Lemma 1 of Claim 1- Every MIT Style output is a New Jersey Style output

1. Scenario 1

1. Suppose that a team called Team X - an ardent professor and practitioner of the classical MIT Style, produces an output which is 100% correct as per their specifications and benchmark tests.
2. However, the same output can be only 50% as good as the output of a different team.
3. Suppose that there is another team called Team Y - which generates an output *identical* to that generated by Team X but such an output meets “just” 50% of the specifications and benchmark tests as decided by Team B initially.

4. Since Team Y's output does not meet 100% benchmark, Team Y would be deemed as practicing the New Jersey Style.
5. So, in this scenario, the MIT Style followed by Team X generates an output "identical" to that generated by Team Y which would be considered as following New Jersey Style.

Hence Lemma 1 of Claim 1 is proved

This can be mathematically expressed as -

$$M \subseteq N \quad - \text{eq (i)}$$

Lemma 2 of Claim 1- Every New Jersey Style output is an MIT Style output

2. Scenario 2

1. Suppose that a team called Team A - an ardent follower of the New Jersey style produces an output which is 60% correct (and exceeds their minimum pass percentage of 55%).
2. Suppose that this 60% output is identical to the output generated by another team called Team B, which follows the MIT Style, and meets their 100% benchmarks tests.
3. So in this scenario Team A's New Jersey Style generates an output that is "identical" to the output of Team B which follows MIT Style.

Hence Lemma 2 of Claim 1 is proved.

This can be mathematically stated as -

$$N \subseteq M \quad - \text{eq (ii)}$$

From eq(i), eq(ii)

$$\Rightarrow M = N$$

Hence Proved -

Theorem 1 -

The Set of outputs produced by the MIT Style and the New Jersey Style is the same set .

Corollary on Theorem 1-

There is no such output which an MIT Style can produce such that it can not be produced by using the New Jersey Style. Every such output that can ever be produced by the MIT Style “can be” produced using the New Jersey Style process and vice versa.

Proof -

This is trivially evident.

Using the concepts conveyed, via the Scenarios 1 and 2, we state that the MIT Style and the New Jersey style follow the same process.

Hence Proved -

Theorem 2 -

“The MIT Style and the New Jersey Style follow the same process”

We would like to draw the reader’s attention to the fact that what differs, if at all, from one team to another team (irrespective of the style the teams might “*claim*” they ardently follow) is “not” the style or process, so to speak, but it is -

x or the minimum pass percentage

The whole point is just to “*calibrate*” the minimum pass percentage. Note that this minimum pass percentage - x is subjective - specific to a team or organization. *There is no such universal benchmark because -*

1. Each team or organization is entitled to come up with their respective specifications, which can be different than those of others.
2. Each team or organization are entitled to set their minimum pass percentage for each specification that they define.

Claim - The MIT Style and New Jersey Style are the same.

Proof -

Since -

1. Both the MIT Style and New Jersey Style follow the same process (from Theorem 2) and
2. The set of the outputs that the MIT Style and the New Jersey Style produce is the same set (from Theorem 1) and also considering the Corollary on Theorem 1

Hence Proved -

The MIT and New Jersey Equivalence Theorem - “The MIT Style is same as the New Jersey Style.”

5. Counterclaims and Further Discussion

5.1 Many use the “Iterative Model”, without realizing though.

We strongly believe that the Iterative Model is used by many, all the time, except that most people do not realize this. We urge the readers to recollect that in Section 3 we proved that the “self-proclaimed ardent followers” of the MIT Style “consciously thought” that they followed the MIT Style, however, eventually it turned out that they were “unconsciously following” the New Jersey Style. Likewise, we think, that the “iterations” are always happening, both in the worlds of the “academia” and the “industry”. We provide two examples from the technology industry and subsequently discuss our notion -

1. The Windows family of operating systems, from Microsoft, is one of the most commercially successful family of operating systems. Microsoft had initially done away with the classic start menu in Windows 8 [2][3][4]. However, subsequently Microsoft re-introduced the start menu. It can be concluded that reduced customer satisfaction would have led to this re-assessment of the design, by Microsoft.
2. Steve Jobs vehemently opposed the stylus [5][6][7], however, recently Apple did a u-turn on Steve Jobs’ stand and released a stylus [8]. This would have been due to the re-assessment made by the Apple’s designers about the utilitarian and aesthetic value of a stylus, especially in junction with Apple’s tablet - iPad and the fact that Samsung (Apple’s rival in tablet market) had already been selling its tablet with a stylus.

The above two points provide the intuition for the notion - Customer Feedback, Revenue from Sales, Competition with rival firm’s similar products “could be” considered as different forms of “benchmark tests”. When a product appears to “fail” on these benchmark tests, as suggested in the formal structure that we conveyed in Section 3 and 4, the “current product” (output) (e.g. Windows 8 “without” start button, Apple tablets “without” stylus) is fed as an input to the Iterative Model or the Generic Process and a subsequent “revised output” (*the next iterations’ output*) is generated (e.g. Windows “with” start button, Apple iPad “with” a Stylus).

Therefore, while many people in the industry and academia may not realize this fact “consciously”, they are indeed “unconsciously” using the Iterative Model, all the time.

5.2 Classical MIT Style leads to the “right” output while the classical New Jersey Style does not

We urge the readers to ask -

1. “What is a right output ?”
2. How to discern an output as the “right output”, and more importantly how to delineate the boundary of “right” to distinguish it from “not right” ?

We think that -

right - a nebulous umbrella term susceptible to varied interpretations by individuals/teams with varied skill sets and motives

We, therefore, question the nebulous nature of the term - *“right”*. We strongly believe, that whereas on one hand, in this paper, we discussed concepts such as specifications, benchmarks, and benchmark test - all of which convey ideas and concepts without ambiguity and are also amenable to scientific measurements and experimentation, on the other hand, the classical MIT Style followers hanker to do the *“so called right”* - without ever categorically *“technically”* expressing what is *“right”*.

The following situation would convey the intuition behind the argument, for this part of the paper-

Suppose that Prof. X, a faculty at world-class university, who is a Computer scientist asks one of his Computer Science graduate students - Mr. Y to design a Software. Both X and Y ardently support and follow the classical MIT Style. Mr. Y designs the software, in accordance with the classical MIT Style, and showcases the output to Prof X. While Prof. X is delighted at the output of his student, he feels that certain aspects of the output software, are *just not “right”*. So he asks Mr. Y to *“improvise”* the software, so that the *“improvised software”* is *“right”* in all aspects, *as deemed by the professor*.

We urge the readers to pay attention to an important observation, which is likely to be overlooked. We said that both X and Y follow and support the classical MIT Style. However, despite Mr. Y's following the MIT Style, Prof. X was able to point out certain aspects of the output by Y, which he *“thought”* were not *“right”*.

What does this imply ? Was Mr. Y not following the MIT Style ? We think, the answer is that Prof. X, being a faculty, has more experience and knowledge of Computer Science than the graduate student Mr. Y. Therefore, it is likely that, Prof. X's interpretation of the word *“right”* is *“different”* than that of Mr. Y.

The point is that, because of difference in the knowledge of Computer Science and professional experience one person's interpretation of the word *“right”* could be *“different”* than that of another person. This is because of the nebulous nature of the word *“right”*. Moreover, this is the main reason, why we support using technical and scientific terms such as specifications, benchmarks, and benchmark tests, as opposed to nebulous terms such as *“right”*. Had Prof. X and the Mr. Y agreed upon, before starting the development of software, on the specifications, benchmarks and benchmark tests this situation could have been easily avoided.

We would request the readers to ask -

3. *Whose interpretation of the word “right” is right ?*

4. *Should the word “right” always be inferred, in light of what the faculty of world class universities and technical experts at giant corporations say ?*

If such, were to be made the case, indeed, then it would make the *“interpretation of the word right”* as collective property of the faculty of world-class universities and a handful of giant corporations (e.g. Apple, Tesla.). This notion, violates the spirit of objectivity which is fundamental to scientific research and innovation. This is because, if the above were the case, then the decisions regarding the *“interpretation of the word right in a technical context ”* would be based on *“blindly following the words of a select few in the academia and the industry”*, rather than being based on objectivity. We feel, that in the long term, the lack of objectivity in decision making process would inhibit research and innovation.

Thus, we conclude that, the word *“right”* introduces ambiguity and does disservice to research and development and innovation. A better approach is to use specifications, benchmarks, and benchmark tests which do not introduce ambiguity and are amenable to scientific research and validation. Thus, we see that cornerstone of the classical MIT Style - *“do the right thing”* does more harm to research and development and innovation than it helps. We have already proved that the classical MIT Style is, at best, an illusion; in this section, we have highlighted the potential damages it can cause to the Research and Development community *“without even the members of the community realizing this”*.

5.3 The classical MIT Style leads to “best” product and New Jersey Style leads to “low quality products”

We urge the readers to think about the following question -

“How would a classical MIT Style follower, today, view Apple Lisa [11] as compared to Apple Mac [12] ?”

The answer, is undoubtedly, that Apple Mac is *“better”* than Apple Lisa, today. If such is indeed the case, then this proves that the *“so called best”* varies with time. The *“best”* of yesteryears might not even be considered *“good-enough”* today. Thus proving the point that, there is no such thing as *“absolute best”*. We request the readers to pay close attention, because once again an important point could be overlooked - Suppose that one assumes, for the sake of argument, that classical MIT Style led to creation of both Apple Lisa and Apple Mac. Then, both of these should be the *“right”* output. However, given the context today, where even the hand-held devices have quad-core processors - which far exceed the computation capabilities of the Apple Lisa, hardly any Computer Scientist or Technology Savvy person would consider using Apple Lisa over Apple Mac. This example suggests that the MIT Style contradicts it self - if both are *“right”* , indeed, then why is one being preferred over another - *because there is no “absolute best” or “absolute right”*.

What may be “best” a time in the history of human civilization , might not be even “good-enough” at another point in time of the human civilization.

“best” - is, at best, a relative and temporal term

We , therefore, urge the readers to no longer be misled by the fake argument that - classical MIT Style leads to “best” products and the New Jersey Style leads to “low quality products”; moreover, when we have already proved in this paper, that both are same.

5.4 High Quality vs Low Quality

We provided a formal structure in Section 3 and Section 4 (see Figure 2) to explain the Iterative Model. When a team using Iterative Model (*it doesn't make a difference whether the team "consciously" claims and follows the Iterative Model or claims not to follow the Iterative Model, but just like the examples in Section 5.1 "without realization" follows the Iterative Model*) sets high benchmark(s) (high minimum pass percentage) then the output produced subsequently is considered as being of High Quality e.g. products by Apple, Tesla Motors. When a team following the Iterative Model sets low benchmark(s) (low minimum pass percentage) then the output produced subsequently is considered as being of Low Quality.

When the specifications of the High Quality outputs are compared to those of Low Quality outputs, produced using the same process (Iterative Model), it *"seems"* to many observers that Low Quality products relative to High Quality products have *"compromises"*. However, the manners in which both of the types of products were produced were fundamentally the same - they used the Iterative Model.

The difference of *"minimum pass percentage"* of the Iterative Model followed for each one of these types (High Quality , Low Quality), should not be considered as a *"difference of style"*, followed to produce products of a type.

6. Conclusion

In this paper, we discussed that the products (software, hardware, technologies) can be categorized as being of High Quality or Low Quality. However, the belief, that MIT Style leads to creation of High Quality products and New Jersey Style leads to creation of Low Quality products and that the two styles are different is incorrect.

We proved that the MIT Style and New Jersey Style are the same, and we termed "the same style" as the Iterative Model. We gave a mathematical proof of the equivalence of both the styles and provided rebuttals against some common arguments which favor the MIT Style.

We have compiled a list of noteworthy points -

1. *Often in the academia and the industry people think in a manner "consciously" but end up behaving in a "different" manner "unconsciously" e.g. we saw that many ardent supporters of the classical MIT Style were "unconsciously" following the New Jersey Style, many in the academia and the industry use the the Iterative Model "without realization" as seen in Section 5.1*
2. *Scientific terms such as benchmarks, specifications, benchmark tests give a clear picture and thus help to spur innovation by providing scientific measurement of the fact that whether progress is occurring in the Computer Science and Technology industry. The terms such as*

“right” are at best nebulous, they cloud the vision and therefore, tend to slow innovation by introducing ambiguity.

3. *In the Computer Science and Technology industry where as certain products are considered as being of High Quality and others are considered as being of Low Quality, the difference in the level of quality of products, captured by the specifications and the benchmarks, must not be attributed to their development styles, but must be attributed to the “minimum pass percentages” of the instances of the Iterative Model followed in both cases.*
4. *Apple computers run on UNIX operating system.*

7. Acknowledgements

This paper is being written as a part of the course “Design of Internet Services” at the Department of Computer Science at Rutgers University - New Brunswick. The author would like to thank the faculty - Dr. Richard Martin for providing his valuable inputs for this paper.

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