Is Scrum is better than Waterfall in the context of Sales Management System (SaleManSys)? What about in context of all software projects?

Student Details:

Name: S M Ragib Rezwan
Student id: 103172423
Email: 103172423@student.swin.edu.au

Content:

Abstract
This research report will be focused on comparison between Scrum and Waterfall SDLC, in terms of the project "Sales Management System" (SaleManSys), in order to show why scrum is better suited for it and try to speculate whether it is superior to waterfall for other software projects too.

Introduction
Currently in modern times, we can hardly imagine life without software. It can be in the form of navigating our way around via GPS, chatting with our peers on social media like "Facebook", or even ordering food via "Menulog". No matter where we look, we see different types of software, both specialized and general purpose, assisting us in completing our tasks and making our lives more far more enjoyable. But have you ever wondered how such software was being developed? How a group of diverse people would gather their ideas together to create something amazing? How there is a "war" going on behind the scenes, to determine a "standard" for their "way of collaboration" or the "development life cycle" in order to improve the efficiency, effectiveness and the quality of the team and thus the software they produce?

Well, fear not, as that is the exact thing we would look at in depth in this report as we compare two such software development life cycle (SDLC), Waterfall (traditional method) and Scrum (an agile method), in the context of the software project "Sales Management System" (SaleManSys)

Background

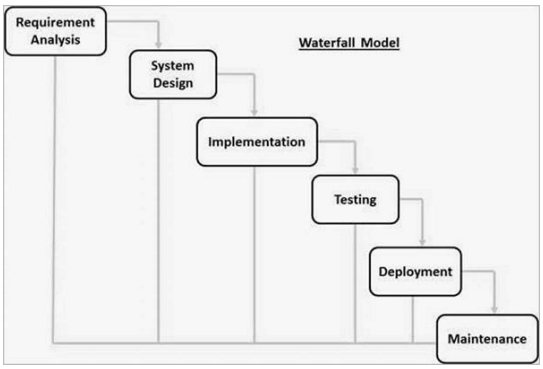
SaleManSys
"Sales Management System" or SaleManSys for short is just one of the regular type of management software that are in quite high demand in today's market, especially for small business (like Ragib Televisions) who are trying to "go digital" **[1].** Although it's main purpose is to just store and retrieve sales records of their televisions, both with high accuracy and in short time, its data can also be used by the company to help their business in various other ways too. This includes, finding out about current customer demands and trends, keeping track of product stocks, etc. Thus, although the software is focusing on a single aspect (ie only the company's sales records), its reach and importance is far greater in the company.

Since the software's importance to the company can be quite clearly understood, it is also important that the team producing the software follows proper standards to overcome all challenges in development, whilst ensure its quality. This leads to the choice on which Software Development Life Cycle or SDLC that team should use:

A) Waterfall
B) Scrum

WaterFall
Waterfall is a traditional development method where the project plan is detailed and fixed at the very start, allowing little to no alteration from the plan later on (even if problems appear or client's demands change). That's because, like a waterfall, it follows a sequence of steps from conception to deployment (and maintenance), with each step heavily reliant on the outcome of the previous step, and

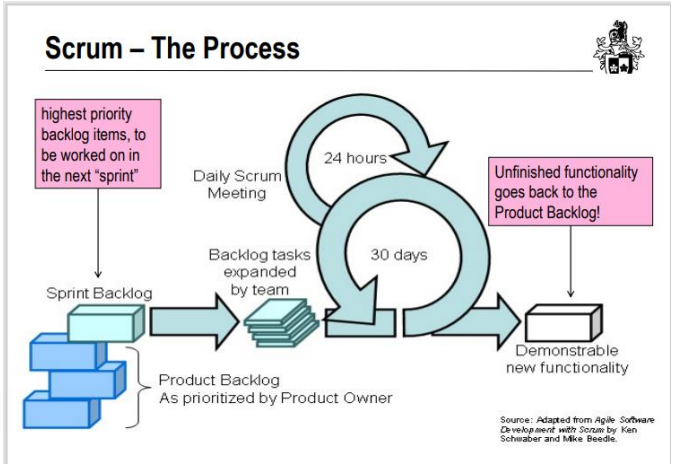
so, once the process starts, there is no way to change it in any way. Furthermore, it only demonstrates the product in its deployment stage where all of its functionalities detailed in the plan have been completed, and thus even if there have been any miscommunication between the client and the team, the feedback can only be received at the very end, which by then is too late.



(Fig. 1 Waterfall Model SDLC. Adapted from **[2]**)

Scrum

Scrum is an agile development method that is mainly used in developing complex, unknown software whilst ensuring both high quality and also the demand of the software being produced. It is done by breaking the big project down into small chunks where each would be completed in short fixed timeframes called sprints with short daily meetings to ensure things are on track. Furthermore, at end of each sprint, the team also demonstrates the functionality produced or the work done with the clients (who are also considered part of the process) to assure them of the software's quality and also gain their feedback on whether to proceed or alter with the pre-decided project plan.



(Fig. 2 Scrum Process SDLC. Adapted from **[3]**)

Comparison in terms of SaleManSys:

Although we can already come to a certain conclusion from the general information regarding both processes *(noted in the two paragraphs above)*, it is better to focus on the software being developed (ie the SaleManSys) and go through all the challenges that lay in its development path one by one to ensure we are not missing anything. Since this a "Sales Management system" for a company that sells television, the following aspects affects the success of the software:

A) Initial Project Scope Inaccuracy/ Team and client misunderstanding
B) Changing customer demand and client requirements (Scope creep)
C) Time And Resource
D) Internal Team conflicts/ member interaction
E) Testing for quality and deployment time
F)

A) Initial Project Scope Inaccuracy /Team and client misunderstanding:

When a project plan is first developed and accepted, it is almost always filled with inaccuracies. This can be especially seen in the management projects of SaleManSys where client's intentions had been quite vague in some of the functionalities they seek. For instance, they stated that they wanted the system to give them monthly sales details but they never stated on how the information would be displayed. It may be in tabular format, chart format, etc. But, since they only mentioned "monthly sales records" and had not detailed on how it should be presented, the team just assumed they wanted it in table or record form instead. Thus, the inaccuracy in scope /customer requirement and the team's understanding of it could only be addressed after either displaying or discussing that feature and gaining the client's feedback on it.

In waterfall, the scope had to be fixed or defined at very start (ie in requirement gathering stage) but validated near the end (in the testing stage). So, the team had thus gone through the all the stages basing upon their interpretation of the client's instruction (noted in the very first stage) while the client had mistakenly believed that they had completely understood their desires. Hence, during the testing and deployment stage when they finally brought in the client for their feedback **[4]**; the client had been disappointed as the product's functionality hadn't been how they had wanted it. But by then it was already too late as the product had already been built and there hadn't been enough time remaining in order to fix this feature in the project. Thus in the end, although the feature had not been exactly what the client had desired, they had to accept it then and ask for another waterfall cycle to correct the inaccuracy.

But in scrum that was not the case as its scope could be easily altered after each sprint is over. Furthermore, since the client is also considered part of the team (as the Product Owner), during the daily scrum meetings, they were also present and thus could clarify their misunderstandings quite easily and early on. Thus, there had been more than enough time to make the modification, fix the inaccuracy, fulfil the client's requirements completely and hence maintain their trust.

So, in this case Scrum had been better than Waterfall method.

B) Changing customer demand and client requirements (Scope creep)

Even if scope had been properly communicated and set at the very start, it may not remain static, especially in case of projects like "Sales management system" for a company. That's because demands of customers, the facilities of the systems used by their competitors and other environmental factors can lead to change in the scope itself. Although, such a thing had not happened in this project, the following instance could have easily taken place:

> "Maybe the company's competitor started to use a system where their sales records would be analysed by an AI in order to not only portray the current product demands but also predict future demands of their customers. Then the company itself

would be hard pressed to get a similar system too, so as to not fall behind. Thus the scope would be altered with a new functionality being demanded by the client"

This is troublesome for waterfall for the same reason as in the point before as due to its rigidity, as once the scope has been set in very first step(ie requirement gathering stage), it cannot be changed until testing stage by which time the project is mostly completed. That's because each step here is highly dependent in the output of the previous step **[2]** and thus developing the new functionality is not possible in the same cycle. Instead the client must wait until the current waterfall cycle is finished before requesting for the new functionality and then wait for a long period of time as the team goes through the same cycle once more. Thus by the time, the system has been developed, the client company would have fallen back by a long time and it might be too late for them to use the software to their benefit **[4].**

In scrum, no such issue exists as each functionality is allocated to certain sprints where feedback from client is obtained at the end of each sprint. So, this change would just be addressed in the end of one sprint (during the customer's feedback) and thus can be easily added to the backlog for it to be developed in one of the later sprints. So, compared to waterfall cycle, only a smaller amount of time and resource would be allocated to the team in order to develop the functionality and thus fulfil the client's desires completely. Thus it would still be on time without much delay, ensuring that the client doesn't lose their competitive advantage.

So, in this case Scrum would be better than the Waterfall method.

C) Time and Resource

Generally, the client would allocate a certain amount of time and resource to the team in order to develop the system. For instance, in this project the client had given the time period of 20 days (or about a month's time) for the team to complete the project with the resource being the amount of money they would pay the team as compensation

In waterfall, the time and resources for a system has been vigorously discussed about and documented in its very first stage (i.e. requirement gathering stage) which in itself took up a lot of time as the time and resource must be kept static throughout the project and so must be error-free. Thus, as long as no change occurred in the surroundings or the project scope, the client would be able to predict the exact date when the system will be operational and the exact amount of resources needed to develop it from the very **[5]**. But if any changes had occurred, far more resources and time would have been needed to address that.

In Scrum, the time and resources needed for the system were quite flexible when compared to waterfall. That is because each functionality (or small groups of functionality) had been developed in their respective sprints which were "time boxed" **[6]** and thus depending on number and type of functionality required, the time and resourced could be altered. So, there had been no need to fix the resource and time needed at the very start and instead it could be refined as the software is developed.

Although this led to higher levels of unpredictability, it could still accommodate for any change that occurs, with far smaller increase in time required and resources used, when compared to waterfall cycle.

So, in this case Scrum is more suitable than waterfall as it accounts for practical situations, where anything can change at any time **[4].**

D) Internal Team conflicts/ member interaction

Generally, whenever a group of individuals team up in order to accomplish a certain task, conflicts arise for several reasons. This can be due to lack of motivation, availability of multiple "solutions" or ways to accomplish a task, external environmental factors like "truck factor", etc. In this project's case, it was due to technological issues (like lack of certain skills or tools, lack of past knowledge regarding management software development, etc.) and communication issue between team members (like member's misunderstanding each other's instructions).

Waterfall resolved this issue by providing a clear and fixed scope, requirement during its first stage (requirement gathering stage) and again in its design stage when deciding the language, framework and other technical details that will be used in the project **[7].** Since it spent a long time in clarifying these details in these steps with all the members in the team, there hadn't been any major technical or communication issues occurring in the later stages when the software was actually being built.

Scrum resolved this in a slightly different way. Here, the team at first declared the scope and the KoST in their project proposal where they detailed the required technical expertise (like skills, tools, pre-existing knowledge and solutions) required. Also, during each sprint, the team performed daily meeting where each member discussed their problems and thus collaborated with one another to make up for their lack of skill or past knowledge. Furthermore, it also promoted self-organisation in the team where the team took ownership in not only doing the tasks but also on solving the problem and producing results, which in turn led to work of high quality **[8].**

Thus, in this scenario, although both SDLCs had their own methods to resolve the issue, we can see that Scrum's method had been slightly better as here as there was far more interaction between the team members whilst doing the project and we already know that effective communication is a major factor in a project's success **[9].**

E) Testing for quality and deployment time

All projects require some form of testing in order to ensure quality has been maintained and then deploy it to assure the client that the system is ready to be used. Thus similar thing had to be done in this software too.

In waterfall, there was only a single step to test all the functionalities of the software with the specifications to ensure that everything had been built following the client's requirements. They had done this by maintaining comprehensive checklist for each and every functionality (like coding standards, architecture reviews, etc.) **[4]** and ticking them off one by one. Although it

took a long time, by the time it had gone through the stage and had been deployed **[10]**, it was not only completely bug and error free, but had upheld the quality requirements which had been decided upon in the requirement gathering stage.

In Scrums case, it was a bit different. Instead of doing a single overall testing of all functionalities at once, each functionality (or functionality group) had been tested during their own sprint time when they had been developed to ensure their quality before considering them as "done". This not only had taken lesser time (as the team had tested each functionality the moment they had finished it and thus had been fully aware of where which part of code had been written) but had also avoided the almost exponential spill over effect where each "undone" or untested parts build up over time, which would have led to an extremely long stabilization period (and in worst cases even delaying the deployment) **[11]**

Thus, although both had their unique ways to perform testing and had resulted in software of similar quality, the Waterfall SDLC took slightly more time in testing and in reaching deployment stage compared to Scrum. Thus, in this factor, Scrum had been better than Waterfall, albeit by a small margin of time.

Conclusion

Overall, we can see that both Waterfall and Scrum are effective ways that can be used develop software. But in the context of the SaleManSys, we can notice that Scrum is more suitable for it in terms of practicality (and also risk management when considering scope change), flexibility, shorter timeframe, more team interaction, more client trust and good quality of the software produced.

But does this mean it will be the same for all software projects?

Not necessarily. That's because although Waterfall is traditional and inflexible, it does have it merits too. Thus if a projects needs to be done where there is well-defined and fixed scope, need little client interaction and need to be done in a fixed and predictable timeline and fixed resource usage (or budget), it will be better for it to be done with waterfall instead as it is more suitable for it.

So, in conclusion, although Scrum SDLC is better than waterfall in terms of developing this software (SaleManSys), this outcome cannot be used to show that scrum is superior to waterfall for all types of project. Instead it would be better to repeat this study in context of other projects before determining overall general conclusion.

References

1) N. Glentworth. "How small businesses can stay on the front foot of digital transformation". NEIL GLENTWORTH. https://www.neilglentworth.com/commentary/2021/9/6/how-small-businesses-can-stay-on-the-front-foot-of-digital-transformation (Accessed May 16, 2022)

2) Tutorialspoint. "SDLC - Waterfall Model". SDLC. https://www.tutorialspoint.com/sdlc/sdlc_waterfall_model.htm (Accessed May 16, 2022).

3) Dr. M.L. Edmonds. (2022). Swe20001 lecture 1b Scrum. [Pdf] Available: https://swinburne.instructure.com/courses/40777/pages/week-1-sdlc?module_item_id=2705766

4) S. Shekhar. "Software Development Life Cycle (SDLC)". Linkedin Learning. https://www.linkedin.com/learning/software-development-life-cycle-sdlc/waterfall-model-brief-overview?autoplay=true&resume=false&u=2091708 (Accessed May 16,2022)

5) L. Hoory, C. Bottorff. "Agile vs. Waterfall: Which Project Management Methodology Is Best For You?".Forbes ADVISOR. https://www.forbes.com/advisor/business/agile-vs-waterfall-methodology (Accessed May 16,2022)

6) M. Rehkopf. "Sprints". ATLASSIAN Agile Coach. https://www.atlassian.com/agile/scrum/sprints (Accessed May 16, 2022)

7) M. Martin. "What is Waterfall Model in SDLC? Advantages and Disadvantages". Guru99. https://www.guru99.com/what-is-sdlc-or-waterfall-model.html (Accessed May 16, 2022)

8) Fowler, Frederik. (2019). Navigating Hybrid Scrum Environments: Understanding the Essentials, Avoiding the Pitfalls. https://doi.org/10.1007/978-1-4842-4164-6

9) H. Estler et al, "Agile vs. structured distributed software development: A case study," Empirical Software Engineering, vol. 19, (5), pp. 1197-1224, 2014. Available: https://www.proquest.com/scholarly-journals/agile-vs-structured-distributed-software/docview/1564862174/se-2?accountid=14205. DOI: https://doi.org/10.1007/s10664-013-9271-y.

10) R. Sherman, Chapter 18 - Project Management, Editor(s): Rick Sherman, Business Intelligence Guidebook, Morgan Kaufmann, 2015, Pages 449-492, ISBN 9780124114616, https://doi.org/10.1016/B978-0-12-411461-6.00018-6. (https://www.sciencedirect.com/science/article/pii/B9780124114616000186)

11) K. Schwaber. "Succeeding With Scrum - a conference by Ken Schwaber (part 1/3)". Youtube. https://www.youtube.com/watch?v=VCzIFn8vt_c (Accessed May 16, 2022)