Riding the Tiger

Verma, Ravi Deshpande, Paresh

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ABSTRACT

Noritake Corporation, Japan wanted to increase the global market share by launching a new tablet named "MegaFutureTablet" containing an application called "Shimano".

Development of this product was based on the Tool Chain and Operating System ColoradoOS by Pheonix Corporation, USA which was still under development. The new tablet used the WiFi[1] Chipset and drivers from Arcom Corporation and Blaze Corporation.

The tool chain was delayed and the quality of the WiFi chipset Drivers was not up to the mark. In addition, there was a mandate to bring down the cost of development. Noritake India, responsible for the development of "Shimano" was facing acute pressure to release it within budget and on schedule with high quality.

This Case study provides a perspective on the challenges of complex global product development with interdependencies among multiple, large corporations.

1. Background and Key Players [2]

1.1. Noritake Corp., Japan

Noritake Corp. is a multinational conglomerate dealing in various businesses. Since last couple of years, it has ventured into consumer product devices for customers in North America, Europe, and Middle East.

The key members from Noritake Corp Japan were -

[1] WiFi is an abbreviation for Wireless Fidelity, refer http://www,wi-fi.org for latest standards and protocols

[2] Refer to Exhibit 3 and 4 for Organization Chart

- Kono san - Senior System Specialist at Noritake Japan. He had past experience as a lead engineer working with the Noritake India engineering team. He was recently given the opportunity to be in a management role and manage the collaboration with Noritake India for developing Shimano.
- Watanabe san: Watanabe san was a senior executive at Noritake Corp responsible for the projects related to tablet devices and applications, in partnership with Noritake India. He had successfully developed multiple projects, including Tone V1.0. When he got promoted and had to move to another role in Noritake Japan, he was replaced by Kono-san from his team.

1.2. Noritake India, India

Noritake India was a subsidiary of Noritake Corp. It was established in July 2003. Over the last decade, it had collaborated with Noritake Corp. for many successful projects. Noritake India also collaborated for consumer product development. It recently delivered the ToneV1.0 application and ShimanoV1.1 was under development.

The key members from Noritake India were -

- Prashant: Project Manager at Noritake, India with about 12 years of design and development experience. For the last 2 years, he was collaborating with Watanabe-san and had delivered several projects.
- Bijoy: Senior Manager at Noritake, India, with about 16 years of planning and delivery experience. He has had close relations with Watanabe san. He had good knowledge of software delivery and product life cycle management.

1.3. Noritake China, China

Noritake China was a subsidiary of Noritake Corp. It specialized in manufacturing hardware and also providing low cost test services.

1.4. Noritake Taiwan, Taiwan

Noritake Taiwan was a subsidiary of Noritake Corp. responsible for hardware design and managing all chip vendors including Arcom Corporation and Blaze Corporation having manufacturing units in Taiwan.

1.5. Arcom Corporation and Blaze Corporation

International companies manufacturing Wi-Fi and Bluetooth chipsets, with good reputation in the electronics industry. The MegaFutureTablet developed by Noritake Corp had Wi-Fi chipset sourced from Arcom Corporation and Blaze Corporation. Some of the tablets used chipsets from Arcom while others from Blaze.

1.6. Phoenix Corp. USA

Phoenix Corporation, USA was a large corporation involved in developing operating system for PC/laptops as well as mobile platforms. It enjoyed a very significant market share. Its recent project ColoradoOS was an operating system built for multiple platforms —desktops, laptop, and mobile devices.

2. Riding a Tiger

It was raining outside, but the temperature inside the conference room was high on the afternoon of 18-June-2015. Kono-san joined from Japan and Prashant and Bijoy joined from India. RC[3] release date was around the corner. The conference call was being held in response to an email by Prashant to Kono-san stating that both Approach-1 and Approach-2[4] do not meet the product requirements. A lot of time had already been lost, and Kono-san was uneasy.

Kono san: I hope you understand missing the deadline will have strong impact on the business. We may lose the opportunity to capture the market share.

Prashant: I understand the situation.

Kono san: Prashant-san, I expect Noritake India team to prepare an alternative proposal quickly to achieve on scheduled delivery.

Prashant: Yes, Kono-san we will do our best.

There was deafening silence in the conference room as the conference call ended.

3. MegaFutureTablet Development

Noritake Corp, Japan had successfully delivered several Tablet devices and applications in collaboration with Noritake, India.

To ensure seamless collaboration[5], Weekly conference calls were organized as follows:

- Noritake Japan and Noritake India for synchronization of project plans
- Noritake Japan, Noritake India and Pheonix Corp, USA for tracking the progress of ColoradoOS 10.0 and Tool chain
- Noritake Japan and Noritake Taiwan, for tracking updates from Arcom Corporation and Blaze Corporation

[3] Release Candidate (RC): A stable build which can be released to the customer
[4] Refer to Exhibit 7 for description of Approach-1 and Approach2-
[5] Refer Exhibit 5 for Project Stakeholders and Information Flow

- Noritake Japan and Noritake China to track testing status.

Noritake Corp. Japan, world leader in electronic and computing devices, wanted to aggressively develop applications for the future operating system, ColoradoOS 10.0 in parallel to its release in July-2015. Noritake Corp. was under pressure to reduce the cost of development (thus, improving profitability) while maintaining the time to market[6].

In the weekly meeting at the beginning of December 2014, Kono san asked Prashant to develop "Shimano" a strategically important application that would differentiate Noritake's future device, MegaFutureTablet, from its competitors. Kono san wanted to development Shimano application on the ColoradoOS 10.0.

Excerpts from the Teleconference Call held on December 02, 2014

Prashant: Kono san, When will Shimano product specification and feature list be available?

Kono san: We are working on the product specification and we will release initial feature list later. However, we would like to emphasize that on time delivery and quality are very important in context of the project.

Prashant: We cannot prepare the software requirement specification (SRS) and acceptance criterion till we receive the Product specification and prepare the initial prototype[7].

Kono san: I understand.

The major components of MegaFutureTablet were:

1. WiFi chipset and drivers under development by Arcom and Blaze
2. ColoradoOS 10.0 to be released on 15-July-2015 by Pheonix Corp. USA. (Note: ColoradoOS 10.0 was expected to have a new architecture).
3. Hardware Design and Evaluation Boards to be developed at Noritake, Taiwan
4. Shimano application, to be developed by Noritake, India. Noritake India Pvt. Ltd had an experienced team that had done application development on ColoradoOS 9.0.

[6] Refer to Exhibit 1 for Project Schedlue

[7] Prototype - A prototype typically simulates only a few aspects of, and may be completely different from, the final product. It was decided to develop a prototype for Shimano as requirements were known only at high level as a goal but what can or can not be accomplished could be known on basis of feasibility established during prototyping.

After an internal brainstorming meeting of the members, Noritake India management decided to accept the challenge[8] to develop Application Shimano on ColoradoOS 10.0.

A few weeks after the first conference call, in one of the weekly meetings on 05-Jan-2015, Kono san told Prashant that Pheonix Corp. had changed the Hardware Compatibility Program and the existing drivers for Wi-Fi and Bluetooth would not meet the quality criterion. They would have to be changed for ColoradoOS 10.0 by Arcom/Blaze.

By 09-Jan-2015, Kono San released an updated feature list. Noritake India carried out the initial analysis of the project size and estimated that the project would require about 55,000 new Lines of code to be developed[9]. On 30-Jan-2015, Kono san shared the updated detailed schedule requirement[10].

Kono san sent an e-mail to the Noritake India Team and informed them about the need to deliver the project by 15-July as compared to his initial product schedule with delivery date of 15-Aug. The schedule was pulled in by 1 month.

Excerpts from an email by Kono san:

... "I have committed to higher management to demonstrate Shimano as part of Japanese Consumer Exhibition; hence we will have to release Shimano by 15-July-2015 without fail."...

Bijoy and Prashant were shocked to see a reduction of 1 month in schedule, with already several new constraints added, especially the movement of system testing work to China, increasing the overhead and complexity of communication. Bijoy told Prashant that it was an impossible target to release 55,000 tested lines of code in 5 months. It's better to reprioritize the requirements and re-look at the estimation again. Prashant requested Kono san to prioritize the feature list and it was agreed to develop only Priority-A features (25,000 Line of Code) for the first version, based on the historical productivity of team[11].

On 30-Jan-2015, Prashant informed Kono san that the tool chain required for the development of Shimano for ColoradoOS10.0 was not yet updated by Pheonix Corp. to the newer version ColoradoOS Development Tools version 2015. Ideally, by now, Phoenix Corp. should have released the tool chain for ColaradoOS 10.0. Kono san said that usually there are no big changes to tool chain and it will be possible to start using ColoradoOS Development Tools version 2013 and migrate to new version when available.

[8] Refer Exhibit 6 for Risk Register to understand the challenges in the project

[9] Refer to Exhibit 8 and 9 for Estimates and Historical Data

[10] Refer Exhibit 2 for Project Schedule

[11] Refer to Exhibit 9 for Historical Data

The team at Noritake India had prepared the initial estimate and resource requirements and requested for 14 Test engineers for development and execution of test cases. However, Kono san had a budget constraint and test Engineers at China were available relatively at a lower cost, he decided to reduce the test team to 7 engineers at Noritake India and pass on the system testing work to Noritake China. Additionally, Kono san took over the responsibility of managing the system testing team in Noritake China, and became the focal point for all communications for that team. Kono San clearly stated all the communication between Noritake India and Noritake China should be through him. Noritake India raised concerns about the possibility of communication delays if the development team in Noritake India did not communicate directly with the test team in Noritake China. It might cause significant delay in the resolution of issues. Kono-san maintained that it would not be a problem and can be managed by him.

Noritake India team released Prototype V1 and V2 of Shimano as per the initial plan on 31-Jan-2015 and 18-Feb-2015 respectively. Meantime, team received the news that ToneV1.0, developed in collaboration with Watanabe san, received appreciation in the CES Tech show in January 2015. Some of the specific observations were as follows:

- Its user interface is well done and is hassle-free.
- Noritake san has done a good job with this one.

To accommodate the resource requirement, Kono san decided that the Japan team would take over the next version of Tone (Tone 2.0) while the India team would continue to focus on development of Shimano application.

As a part of Feasibility study on 15-Feb-2015, it was found that ColoradoOS 9.0 does not support background services. Hence, once the application on the HOST device goes to background, there is no way for it to communicate with other CLIENT devices. It will affect the key features of application. Team informed this critical missing feature of the operating system to Kono san and marked it as major risk in the risk register. Team recommended two workarounds[12].

In addition to the above-mentioned issue, by 27-Feb-2015, the team discovered three other critical issues —totally four (let's name them Issue1 to Issue4) from the interim versions of software delivered by Arcom, Blaze and Pheonix Corp that impacted key features of Shimano.

Prashant released the Software Requirement Specifications (SRS) and Risk register[13] to Noritake Japan after review with subject matter experts on 20-Feb-2015.

[12] Refer to Exhibit 10 for description of Workarounds

[13] Refer Exhibit 6 for Risk Register

Since Kono san had already committed to senior management, the schedule could not be changed in spite of some of the risks being realized. What follows is the excerpts from a teleconference call that happened on 24-Feb-2015 for review of SRS

Prashant: Kono san, we have released the SRS and Risk register to you.

Kono san: Yes, we have reviewed your SRS document.

Prashant: Kono-San, can you please look at the acceptance criterion and let us know what the expected performance for each of the deliverables is?

Kono san: Yes, we will let you know later.

Prashant: Kono-san, let's look at the risk register, we have several open risks related to issues in the driver released by Arcom and Blaze, and additionally we have risks related to the release of ColoradoOS Schedule, issues and possible delays in the release of tool chain by Pheonix Corp.

Kono san: Yes, that's right, we understand the risk.

Prashant: Kono san, do we need to factor possible delay in release in our schedule?

Kono san: No, please make the schedule without considering any delays due to realization of risks. Usually Pheonix corp. releases software on time and not many changes happen in their tool chain and architecture.

Noritake India team continued with the development of the features as per the initial User Interface (UI) specifications.

Noritake India team received the following e-mail on 16-Mar-2015

..."Dear Prashant-san Please find attached our updated UI specifications. There was a delay in preparing final UI specifications due to lack of resources, however, headquarter feels that modified specification must be used due to its enhanced user appeal, Sorry for updating again. Best Regards, Kono."...

Prashant had an emergency meeting with Bijoy.

Prashant: Bijoy, We have already received 3 versions of UI specifications so far and I am not sure if what we received today is final. We will not be able to meet the schedule if we have to comply with the latest UI specifications.

Bijoy talked to Kono-san about the situation, and got the reply that usually product and UI specifications keep getting updated based on marketing team's feedback and development team needs to accommodate them in the existing schedule.

Meanwhile Phoenix Corp released interim version of ColoradoOS 10.0 along with tool chain on 12-March-2015. Pheonix Corp recommended Approach-1 and Approach-2 to resolve Issue4 (related to background services)[14].

[14] Refer Exhibit 7 for description pf Approach-1 and Approach-2

In the weekly call Kono san requested Prashant to provide estimates for Approach 1 and Approach 2. Prashant pulled out 2 team members from other activities and appointed them to work on Approach1 and Approach2. After 4 weeks of effort and several discussions with Pheonix Corp, Pheonix Corp accepted that both Approach1 and Approach2 cannot solve the Issue4. Since it was a use case limited to very minimal customers, Pheonix Corp had no resources or plan to support it.

Noritake India team continued further development while exploring additional approaches to resolve issues in parallel until Alpha release, that is when Noritake India team discovered that First QA test cycle cannot start on schedule.

Excerpts from Weekly Telephone call held on 22-May-2015

Prashant: Kono San, we would like to receive system test results of Alpha release. Is it possible to check with Noritake-China team and let us know when 1st QA results will be available?

Kono san: I am sorry Prashant san, but Noritake China system testing is delayed by 2 weeks due to delay of test specification development and Test set-up preparation.

Prashant: Kono san, we have shared updated Risk register to you, if we receive issues at later stage it will impact our quality and schedule of Beta release.

Kono san: Yes, I understand.

Finally, 1st QA testing cycle reports were available and it was concluded that Issue4 still exists and additional new issues were reported.

In a joint review meeting, it was decided that Noritake India has to resolve outstanding issue4 by workaround technique before Beta Release and resolve other outstanding issues reported during 1st QA testing cycle.

Bijoy and Prashant were left with following issues before Beta and RC Release while they prepare for call with Kono san on 18-June-2015.

1. Find Workaround for Issue 4
2. Resolve discrepancies between Product Specification, SRS and Test Specification and conclude if new issues are due to mismatch among the specifications, due to WiFi chipset driver issues or actual software issues
3. Use latest development tool chain, WiFi chipset drivers but interim version of ColoradoOS
4. Resolve software issues if any

Exhibit 1: Shimano project time-line

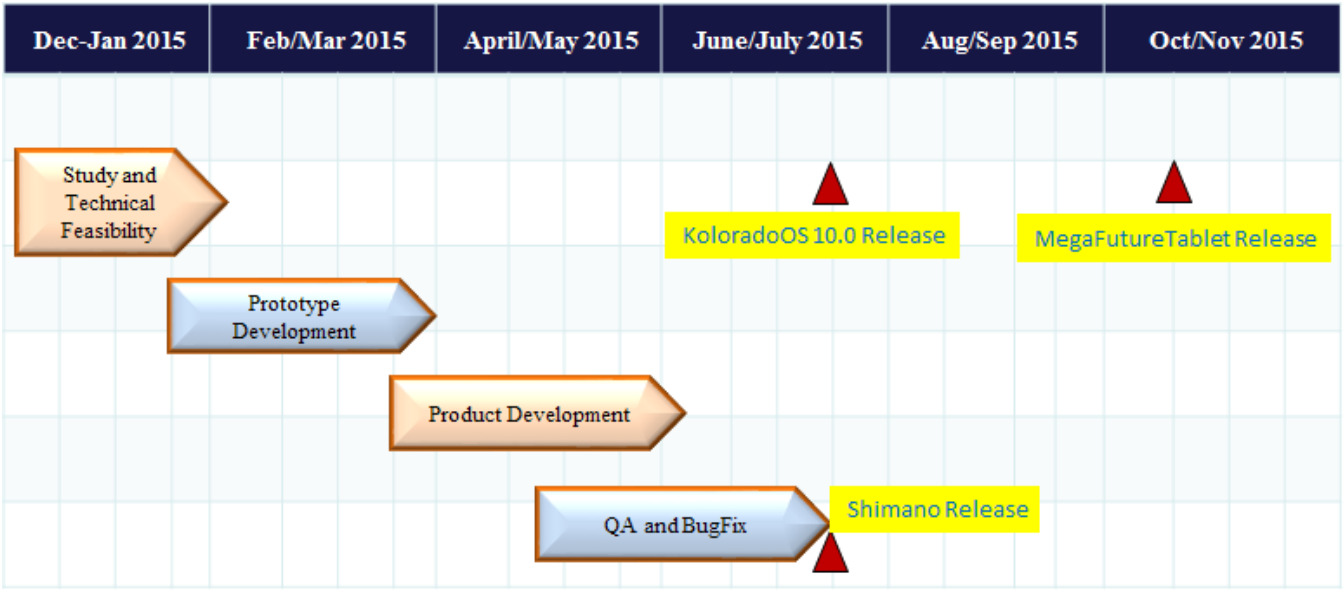

Exhibit 2: Shimano project schedule

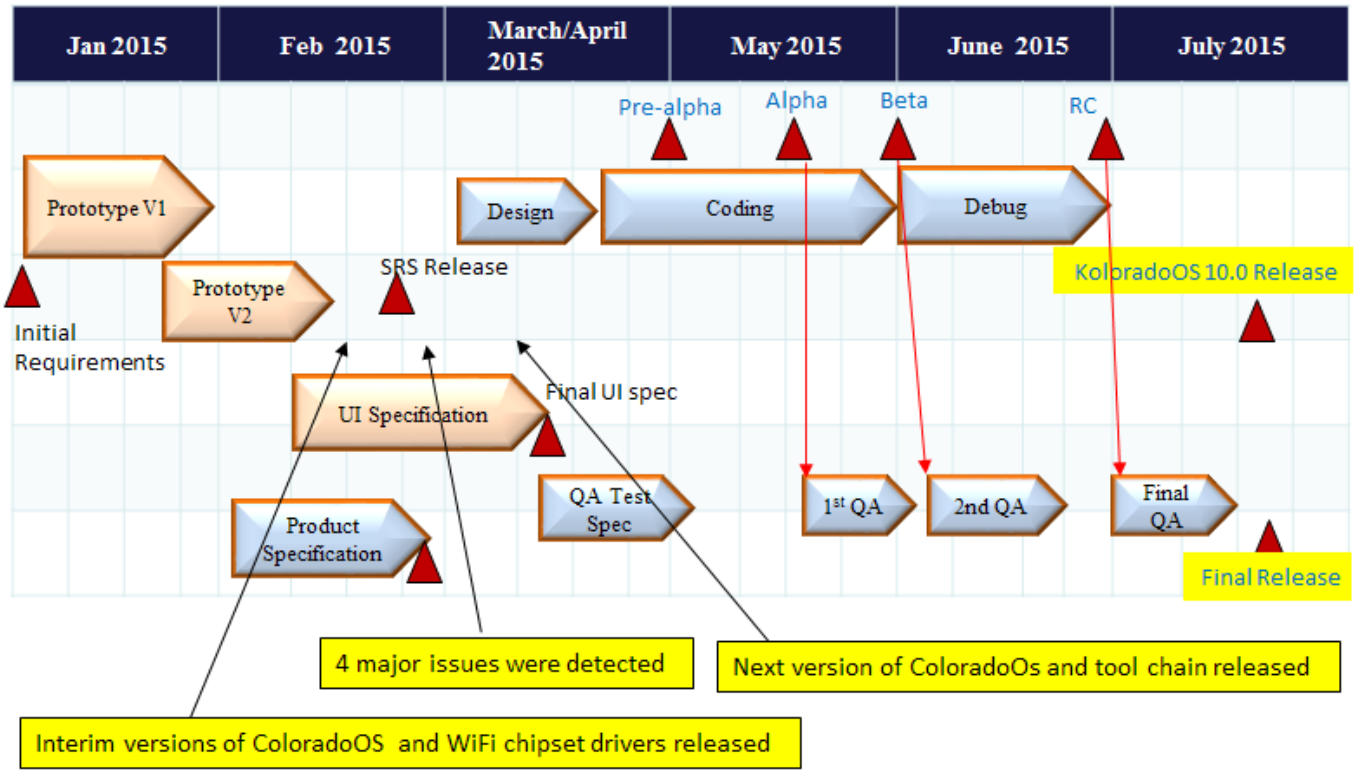

Exhibit 3: Organization Structure - Noritake Corp.

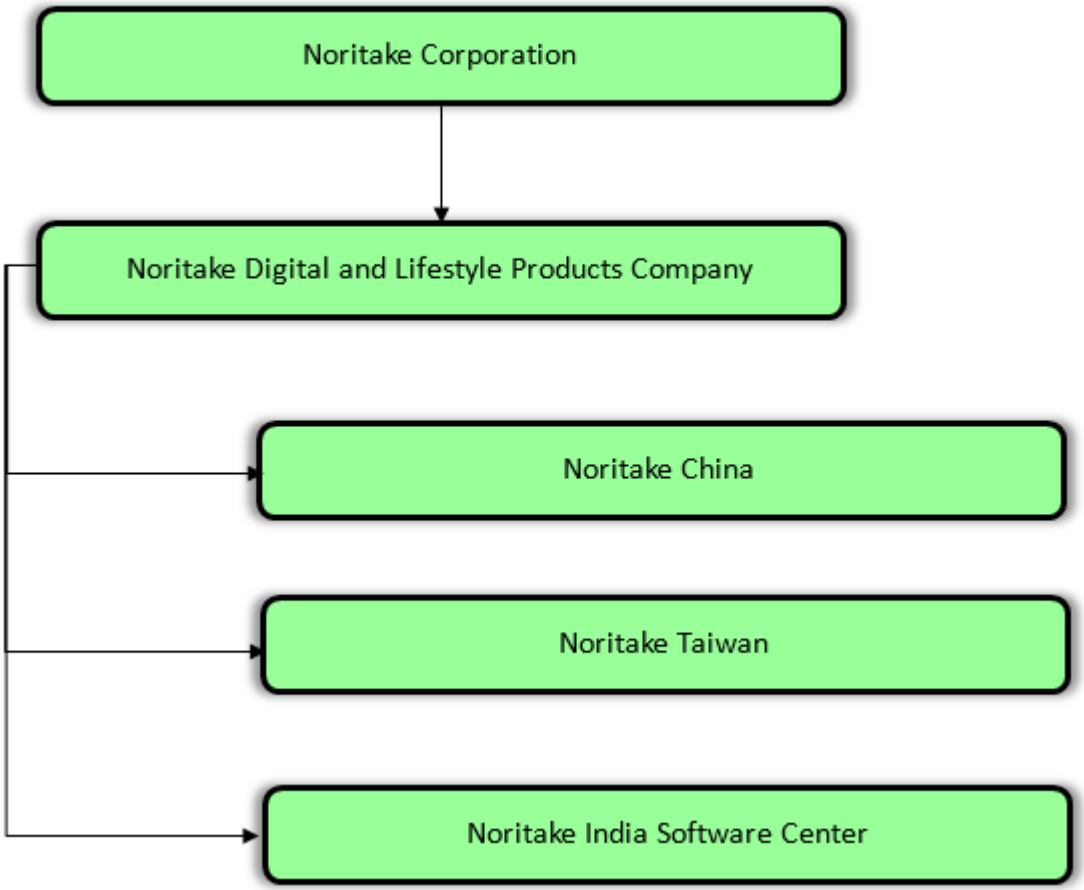

Exhibit 4: Shimano project team

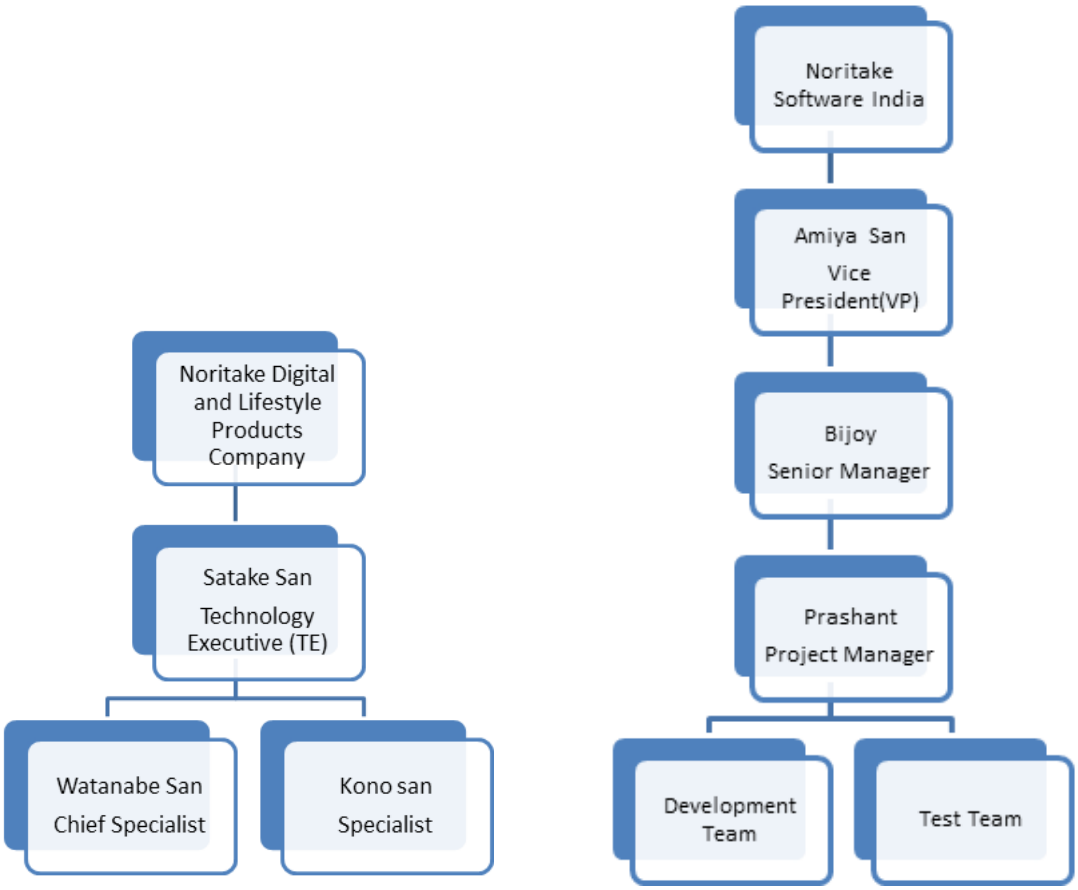

Exhibit 5: Project Stakeholder Diagram and Information Flow

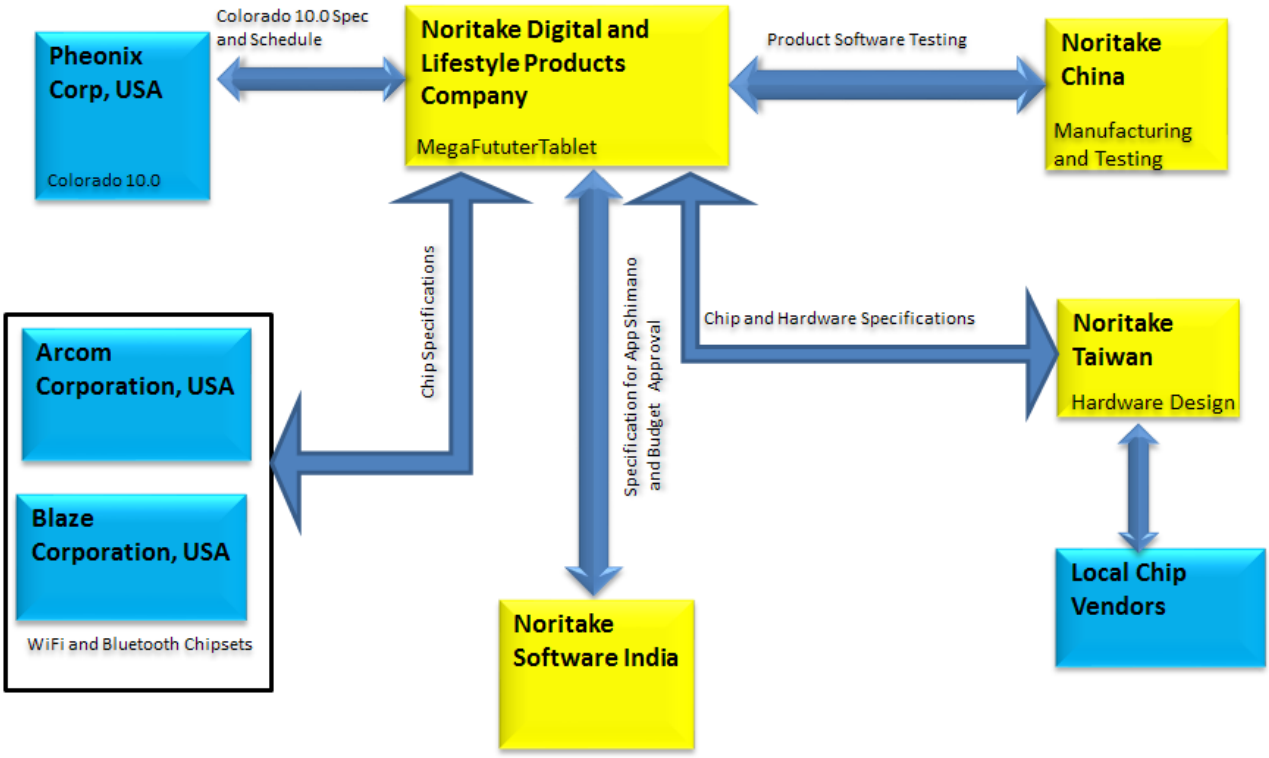

Exhibit 6: Shimano Project Risk Register

#	Risk	Owner	Trigger Date	Mitigation	Contingency
1.	ColoradoOS 10.0 final release is on 15 Jul same day as final release of Shimano.	Noritake India	12-Mar	Development and testing of application on Interim versions of ColoradoOS 10.0	To change the final release date or to move feature to next release based on impact
2.	Delay in resolution of Issue4 from Pheonix Corp will impact on Shimano schedule.	Noritake India	8-May	To try Approach 1 and Approach2 as suggested by Pheonix Corp.	To see possibility to limit the feature.
3.	Delay in UI specification impacts on Shimano schedule and quality.	Noritake japan	31-Mar	To adjust internal milestone if impact is limited	Adjust final schedule or to move feature to next version.
4.	Delay in resolution of Issue1 and Issue2 by Arcom Corporation/Blaze Corporation impacts the schedule.	Noritake, Taiwan	8-May	Discuss OS workaround with Pheonix Corp To track closely Noritake, Taiwan	Adjust final schedule.
5.	Any big architectural changes in ColoradoOS 10.0 will impact the schedule.	Noritake India	18-Jun	To weekly check with Pheonix Corp to for any design changes.	Adjust final schedule.
6.	Delay in starting the QA testing will impact the schedule	Noritake Japan	27-Apr	Adjust other milestone and keep the final release.	Adjust final schedule.
7.	Any issue reported after bug cut-off date will impact the final release date.	Noritake Japan	10-Jul	QA team to complete the test cycle for all features of and raise issues before bug cut-off date	Adjust final schedule.
8.	Final release of Shimano shall be made using Interim Release of development tools. Any issues found on final release of ColoradoOS Tools will impact the schedule.	Noritake-India	10-Jul	To check with Pheonix Corp to for any major changes in Tool.	Adjust final schedule based on severity. Move some features to next version based on impact.

Exhibit 7: Suggestions by Pheonix Corp

Approach 1

A new feature in ColoradoOS 10.0 “Service Socket API”. It will allow communication to happen on background. But might have some limitations. After investigation effort at Noritake India, it was found, if multiple devices send data at the same time, ColoradoOS cannot handle and services crashes.

Approach 2

Limited background service, it might pick up data at fixed interval as per ColoradoOS policy. After investigation and putting effort at Noritake India, it was found that the fixed interval as per the ColoradoOS policy was more than 5 minutes and it was not suitable for the application.

Exhibit 8: Estimations

Wideband Delphi[15] was used as Lines of Code (LOC) estimation for the project. Effort estimation was done based on the historical project metrics data.

Module	LOC
User Interface and interaction logic	25000
Rendering Engine	15000
Database Engine	10000
Network	5000

[15] Wideband Delphi estimation method is a consensus-based technique for estimating efforts.

Exhibit 9: Historical Data

Parameter	Value	Definition
Productivity	23	Lines of code per day over complete project life cycle
Defects per KLOC	4	Number of test defects per 1000 lines of code
Defect Cycle Time	3	Average number of days to fix a defect
Reopened Issues Rate	2	Number of issues reopened per 100 issues reported

Exhibit 10: Work-around for Background Task Feature

1. To let operating system handles the connection. Ones operating system closes the network for background tasks, let all clients communication to be automatically stopped
2. To display message box on all the devices that host task has gone in back ground and data exchange is paused.