CORP

IS3103 DIGITAL TRANSFORMATION PROPOSAL

GROUP 11C

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Executive Summary

This proposal documents the background of the construction industry, the background of RVRJ Corporation, assessment of the Covid-19 pandemic impact on the construction industry, our analysis on the challenges faced by RVRJ Corporation as well as our recommended solutions to transform the business.

The key challenges that RVRJ Corporation faces are labour shortage, safety, low productivity, lack of IS leadership and poor technology management. These challenges have resulted in the lack of a competitive advantage for RVRJ Corporation especially considering the highly competitive nature of the construction industry. Furthermore, a strategic grid analysis performed on the company's existing technologies revealed the low reliance on IT and adoption of new technology. Our proposed solutions will thus focus on implementing novel IS solutions to solve the challenges identified.

After analysing the trends of the construction industry and technologies, our team is proposing four solutions, namely the introduction of Internet of Things and Analytics, a new information system infrastructure, introduction of augmented reality, and organisational restructuring. We believe that the aforementioned changes are able to spearhead RVRJ's Digital Transformation, allowing it fully embrace and harness its potential IS and IT capabilities.

We have designed a three-stage implementation plan that can aid RVRJ in adopting the proposed solution safely and effectively to achieve its desired outcomes. A feasibility assessment of the transformational change was done by assessing the economic, technical and operational feasibility of the solutions. We have also crafted a six-step change management plan that RVRJ can adopt to manage the transformational change during the implementation.

1. Background

1.1 On the Industry

With total annual revenue of almost $10 trillion and accounting for 6% of the world's GDP, the construction industry is one of the oldest and biggest industries today. The industry has remained as one of the most important and relevant industries to society, where virtually every business and person relies on the industry to provide accommodation as well as infrastructure to maintain their livelihoods.

1.1.1 Key players in Singapore's Construction Industry

Industry leaders[1]	Details
LUM CHANG	Annual revenue: over $150 million Prominent projects: ● The Metropolis ● Changi Business Park ● Prudential Tower
HSB HWA SENG BUILDER PTE LTD	Annual revenue: almost $150 million Prominent projects: ● Lake Life ● Heron Bay ● The Urbanite
KTC KTC GROUP	Annual revenue: around $100 million Prominent projects: ● Marina Bay Sands Integrated Resort ● Resorts World Sentosa ● Tampines Central Station

Despite the industry's maturity, its performance has been lagging with below-average productivity growth and low profitability, at around a 5 per cent EBIT margin. This can be largely attributed to the characteristics of the market, whereby varied customisation demands allow for little standardisation across the market, and high dependence on labour and strict regulations impede its growth. There is also fierce competition within the industry due to the low barriers to entry for less complex construction projects and high substitutability between the offerings of different construction companies. This competition calls for a greater need for construction companies to differentiate themselves through offerings such as technology to remain competitive.

In recent years, due to the introduction of the Building Construction Authority's (BCA) Construction Industry Transformation Map (ITM) (Figure 1), there have been a series of transformational reforms that have pushed the construction companies within Singapore to take steps towards ensuring digitization and sustainability.

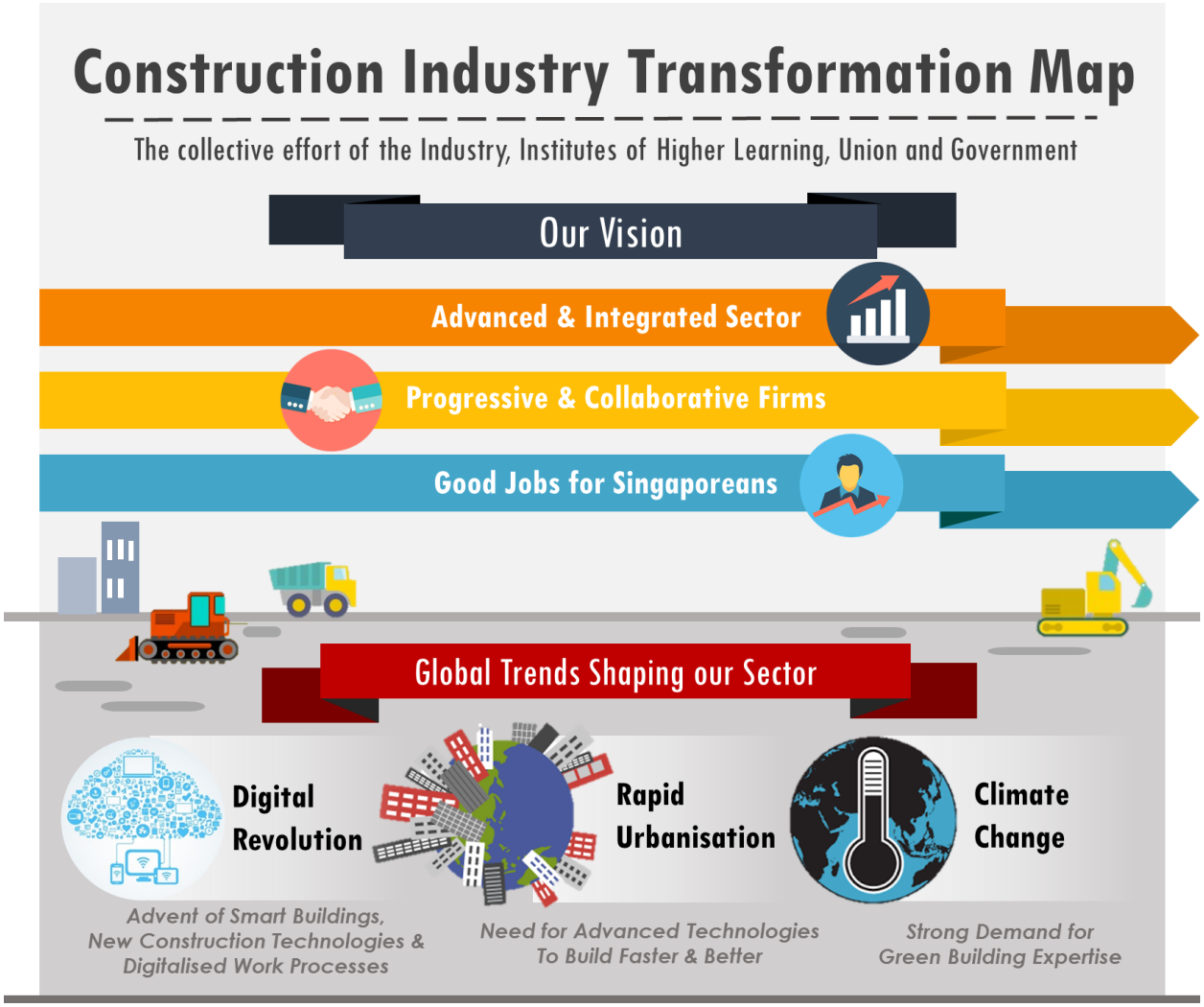


Figure 1: Construction Industry Transformation Map[2]

However, the construction industry remains one of the least digitized industries and is slow to embrace new technologies. Based on McKinsey's Global Institute Industry Digitization Index, the industry is ranked the second least digitized industry. This can largely be attributed to the lack of trial and tested technological solutions, which many companies are reluctant to adopt due to the potential economic damages and safety issues should it fail. Furthermore, the industry's maturity has also played a crucial role in this strong reluctance towards digitization.

1.2 On the Company

RVRJ Corporation is a pioneering construction company based in Singapore with a legacy of more than seven decades. It has a rich history and strong ties to the Built Environment culture in Singapore. Listed on the Singapore Exchange since 1984, the Group has evolved and grown to include businesses in property development and investment. RVRJ's customer segments include both consumers (B2C) and other businesses (B2B). The nature of products and services that RVRJ provides are real estate, interior design and construction.

1.2.1 Strategic Grid Analysis

A strategic grid analysis using Nolan & McFarlan's IT Impact Grid model was performed on the existing IT/IS adopted by the company.

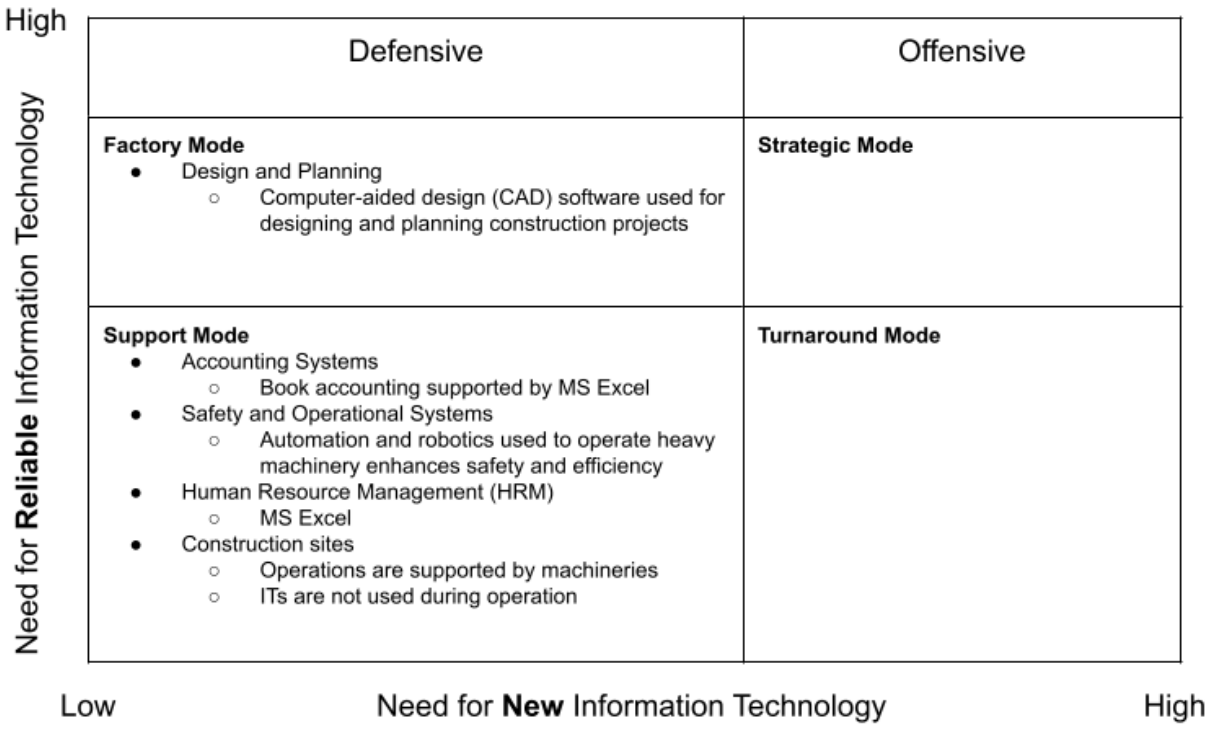


Figure 2: Strategic Grid Analysis

Most existing technologies fell under the Support mode category (Figure 2). Thus, IT does not play an important role in the day-to-day operations at RVRJ's construction sites. For example, accounting and HR systems are supported with limited data processing software. Most of such operations can continue even if a major technology outage were to occur. The company hopes to work towards the Strategic mode category and adopt new and reliable technology in its operations.

2. Covid-19 Impact

2.1 Short-term impacts

2.1.1 Weak demand and narrow profit margins

The pandemic has caused the demand for construction to fall drastically. According to the Building and Construction Authority of Singapore (BCA), construction demand fell 54.9% from its initial projected demand of $33 billion to $21.3 billion, the lowest since 2009[3]. Covid-19 has caused many of RVRJ's projects to be delayed or suspended, and the lack of a proper plan due to the sudden pandemic has led RVRJ to adopt a "wait-and-see" approach. RVRJ experienced around 55% of their projects being suspended indefinitely, with 20% continuing with strict and restrictive guidelines. This pause in business has resulted in RVRJ suffering significant economic losses as it was unable to complete many planned projects and thus unable to accept new ones.

2.1.2 Significant Delay in completion of construction projects

The shortage of a local labour force in RVRJ resulted in the heavy dependency on unskilled foreign labour to work on RVRJ's construction projects, with 78% of RVRJ's workforce being foreigners, the bulk of which are work permit holders. However, the security and safety of these groups of workers have been particularly vulnerable due to the pandemic. The tightened border controls have limited the inflow of foreign workers designated to work on construction projects resulting in a severe labour crunch. A growing number of RVRJ workers are also unable to report for work as they are tested positive for Covid-19 and have to undergo quarantine. Safe Management Measures (SMMs) imposed by the government further restricts the number of workers that can be physically present at construction sites. Collaboration between the workers becomes an immense challenge given the current pandemic. These factors result in a steep decline in the number of physical activities carried out on the site, leading to numerous delays in the construction projects.

2.2 Long-term impacts

2.2.1 Change in building design standards for buildings

The pandemic has resulted in increased attention on issues such as indoor air quality and ventilation systems. Due to this shift in attitudes, RVRJ has witnessed a greater demand for better ventilation and air quality incorporated in their construction projects, especially in enclosed spaces, due to the high risk of disease transmission. This demand is also coupled with changes in the design standards and building codes on aspects such as air-conditioning and mechanical ventilation that RVRJ may have to consider in future buildings. New changes to building code SS553 would require High-efficiency filters with ratings of at least MERV 14 to be installed and operated in Air Handling Units that treat recirculation air. Higher costs are incurred by RVRJ to design and build infrastructures that account for the regulations and also to retrain workers to adapt to the updated building codes.

3. Challenges faced by RVRJ Corporation

3.1 Labour Shortage

3.1.1 Shortage of Low-skilled labour

With a large majority of the RVRJ's workforce being low-skilled migrant workers from neighbouring countries, the company relies heavily on such workers to ensure continuity in its operations.

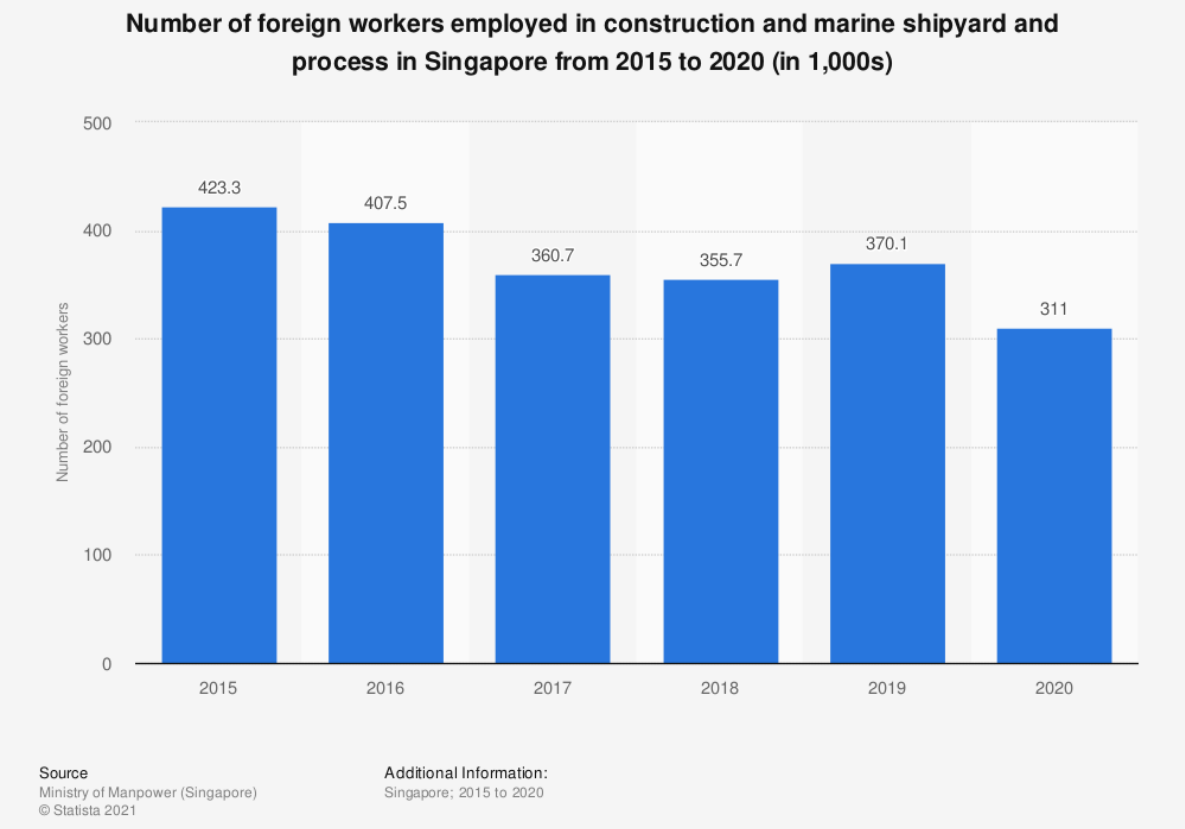


Figure 3: Number of foreign workers in construction and marine shipyard and process[4]

RVRJ also needs to bear the brunt of current policies, for example Singapore's tight border restrictions from April 2020 due to the pandemic has limited the inflow of foreign workers from overseas, such as India and Bangladesh. Moreover, beginning 1st January 2021, RVRJ will only be permitted to employ S Pass holders as 18% of their total workforce. These policies RVRJ has to abide by, greatly limits the number of low-skilled foreign labour that RVRJ Corporation can employ (Figure 3).

A severe lack of low-skilled labour to perform the company's essential and operational tasks, coupled with the increased demand for construction projects, puts RVRJ in a tight labour crunch.

3.1.2 Shortage of High-skilled labour

RVRJ Corporation is also having difficulties finding skilled and qualified workers.

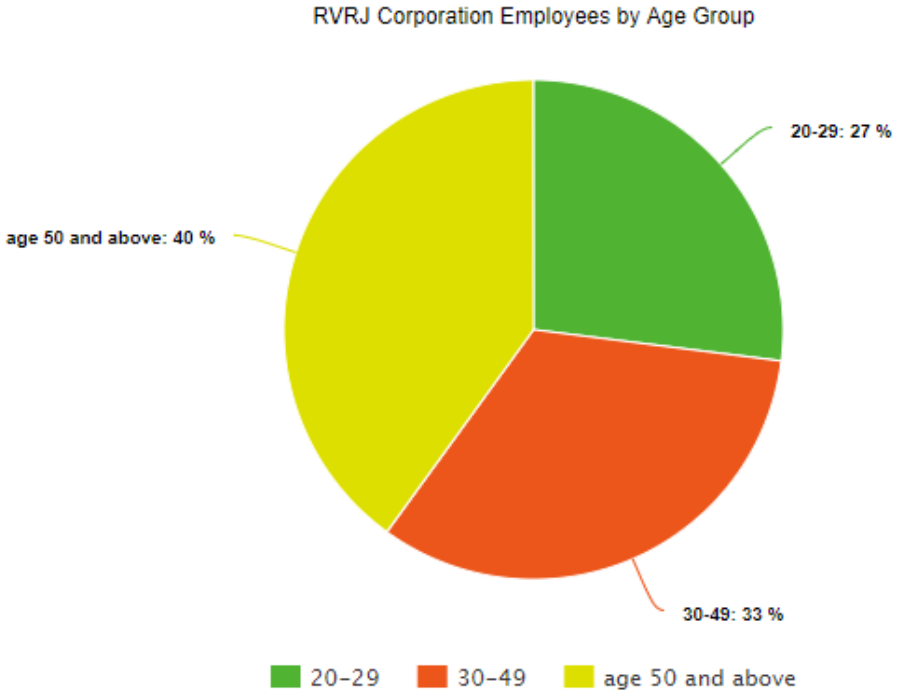


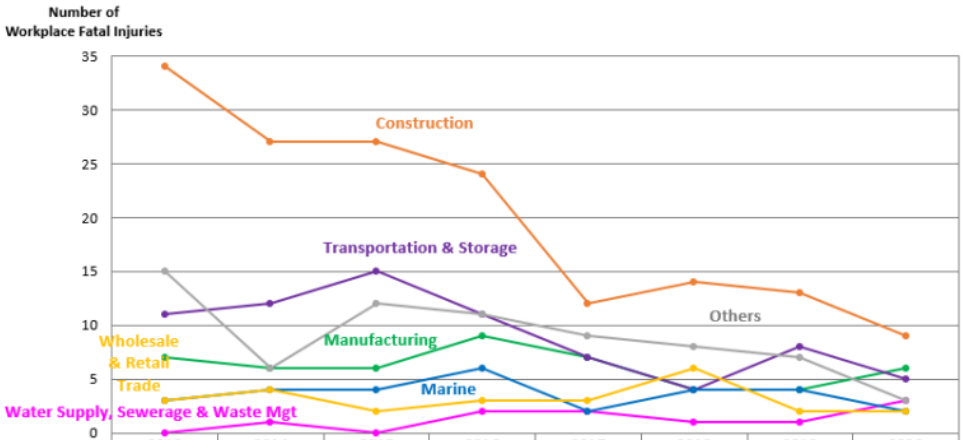
Figure 4: RVRJ Corporation's employees by age group

RVRJ's skilled workforce is relatively mature. 40% of the labour force is made up of workers who are aged 50 years and above (Figure 4). A considerable number of them are also close to the retirement age. As a result, RVRJ experiences a significant drop in skilled employees every year due to retirement from old age. The number increases further as many workers opt to retire earlier considering the current covid situation[6]. Moreover, RVRJ is facing difficulty in replacing their skilled workers despite increasing their offerings as a considerable number of construction companies are competing to attract the decreasing number of young talents entering the industry.

Furthermore, the adoption of new technologies by RVRJ, such as the 3D design and modelling software, BIM, requires a labour force equipped with the knowledge on how to operate such technologies. This poses an issue for older workers in RVRJ who are less adept in using such new systems as compared to traditional methods such as blueprints. This stagnates the productivity and efficiency of current workers resulting in more workers required to replace them. Moreover, RVRJ has to hire new specialised workers such as BIM developers and BIM support members to support such technologies. It may be challenging to find talents due to the relatively nascent nature of such technologies.

3.2 Safety

Safety has been a long-standing issue within the construction industry. It has the highest number of workplace fatal injuries since 2013 (Figure 5). The hazardous nature of the work environment coupled with the dangerous tools involved results in a host of possible safety issues that occur at every aspect of the project.



	2013	2014	2015	2016	2017	2018	2019	2020
Construction	34	27	27	24	12	14	13	9
Manufacturing	7	6	6	9	7	4	4	6
Transportation & Storage	11	12	15	11	7	4	8	5
Water Supply, Sewerage & Waste Management	0	1	0	2	2	1	1	3
Marine	3	4	4	6	2	4	4	2
Wholesale and Retail	3	4	2	3	3	6	2	2
Others[10]	15	6	12	11	9	8	7	3

Figure 5: Number of workplace injuries by industries, 2013 - 2019[7]

Most construction companies place a huge emphasis on safety to reduce potential workplace injuries or even deaths. These can significantly damage their reputation to their clients and deter future workers in an already labour-crunched market. Companies face additional costs due to potential negligence, fines, workers' compensation, and expenses incurred when operations are temporarily halted in light of such breaches.

RVRJ Corporation currently instils a strong safety culture within its company. RVRJ adopts an eight prong approach towards safety that encompasses constant safety training and promotion, adopting preventive methods, and committing to health and safety from the management. Furthermore, the Ministry of Manpower has also put in place various regulations that RVRJ abides by to monitor safety. For example, the CheckSafe e-Service that dishes out demerits to companies who have significant safety-breach records[8].

However, despite such efforts, safety continues to be a pressing issue in RVRJ, which reports higher than average workplace injuries and deaths every year. Many of these injuries have resulted from personal negligence and the nature of the job. The everchanging construction requirements from different projects also result in difficulty in determining adequate safety measures to adopt. Especially when doing a hazard assessment of a construction site, RVRJ Site Managers extrapolate and regulate this based on past data of similar projects manually.

This results in the high possibility of human error in the data extrapolation and a flawed assessment of the construction site, where they may overlook potential hazards and underestimate the integrity of various structures.

The safety concerns of the industry is a significant business challenge that needs to be addressed since the industry is heavily reliant on human capital. Hence, safety and risk management is pivotal to RVRJ Corporation's success.

3.3 Low Productivity

Despite RVRJ Corporation's mature standing in the industry, it still faces an issue with low productivity. With a decreasing value-addition per employee in the company compared to previous years, this is a particularly worrying challenge for RVRJ.

RVRJ dedicates approximately 64% of labour time to waiting for construction tools, materials and equipment or the constant revisions to plans during the planning phase. Most of the workers are left idle, and the project stagnates during the waiting time. As a result, the constant idling due to supply and workflow inefficiencies led to only 15% of major projects in RVRJ's portfolio completing on time and averaging 20% longer than its scheduled time for completion.

The delays from low productivity in RVRJ Corporation has resulted in a vicious cycle that has affected the company's bottom line. With an already low-profit margin from their construction projects, these delays only seek to increase the costs of the projects as RVRJ spends more on its labour and operations. This shrinking profit further reduces the ability of RVRJ to invest in solutions to combat the existing inefficiencies.

3.4 Lack of IS Leadership

There is a lack of technical leadership within the RVRJ senior management and directorial board. RVRJ's directorial board consists of 11 members from varying fields like real estate and civil engineering but none from any technical background. Half of the board have also been serving RVRJ since the early 2000s and are used to traditional construction workflows done with little to no technology involved.

As such, they are unfamiliar with the implementation of technology and are unable to identify the risks and benefits of adopting new technologies and drive RVRJ's implementation of new innovative technologies. This lack of support for innovative IT implementation is evident from the budgeting towards innovation and technology within RVRJ Corporation making up only 3% of its total revenue.

3.5 Poor Technology Management

3.5.1 Lack of IT Governance and Portfolio management

RVRJ Corporation does incorporate some forms of technology, such as the usage of BIM to do 3D Modelling and basic ERP systems to handle payroll and human resource management. However, due to the lack of a dedicated IT Governance team within RVRJ, most of these implementations go unchecked. Furthermore, the lack of a Project Management Office (PMO) also results in a lack of management and alignment of the current technology with RVRJ's goals.

The lack of management and regulation on technology adoption results in varying forms of technology adopted within the company. Business units such as the HR department enlist the help of third-party providers to implement and support their CRM, whereas the engineering team depends on its in-house developers to manage its BIM software. This results in poor standardisation across business units and also leads to poor adoption of technology. Whereby untrained personnel within the business units adopt systems and technology that are not dedicated to the company, and causes increased inefficiencies and costs to the company.

The lack of governance also exposes the company to the threat of cyber attacks. RVRJ Corporation, as a construction company, works with critical data, some that can be deadly if fallen into the wrong hands, such as engineering calculations and safety documents. Hence, any cyber attack and manipulation of such crucial data can have devastating consequences.

3.5.2 Lack of collaborative tools

RVRJ Corporation has five main business functions under its construction portfolio, namely: Finance, Design & Engineering, HR, Marketing and Operations. In a construction project, all these five business units must collaborate and work together during different stages of the projects' life cycle to effectively and efficiently complete a project on schedule. However, these multiple business functions are currently run by different departments in the company at varying stages of technology adoption and different workflow procedures optimized for their own use cases.

Though this may be ideal for the business units individually, it has proven to be inadequate when the business units have to work together for construction projects.

Moreover, as the design and building requirements by clients get increasingly complex, the low productivity and efficiency of RVRJ further lengthen project completion time. To push out their projects on time and follow the standards, projects of such high complexity require efficient coordination due to the constant revisions and relay of information across all parties. However, RVRJ does not have the right tools or assets to handle project collaborations at such a level. Hence, resulting in an inefficient workflow that only delays the completion of the project further.

4. Recommendations

The solutions and recommendations that RVRJ Corporation will undertake will be structured around the three core competencies of a value-centric IT Organisation (Figure 6).

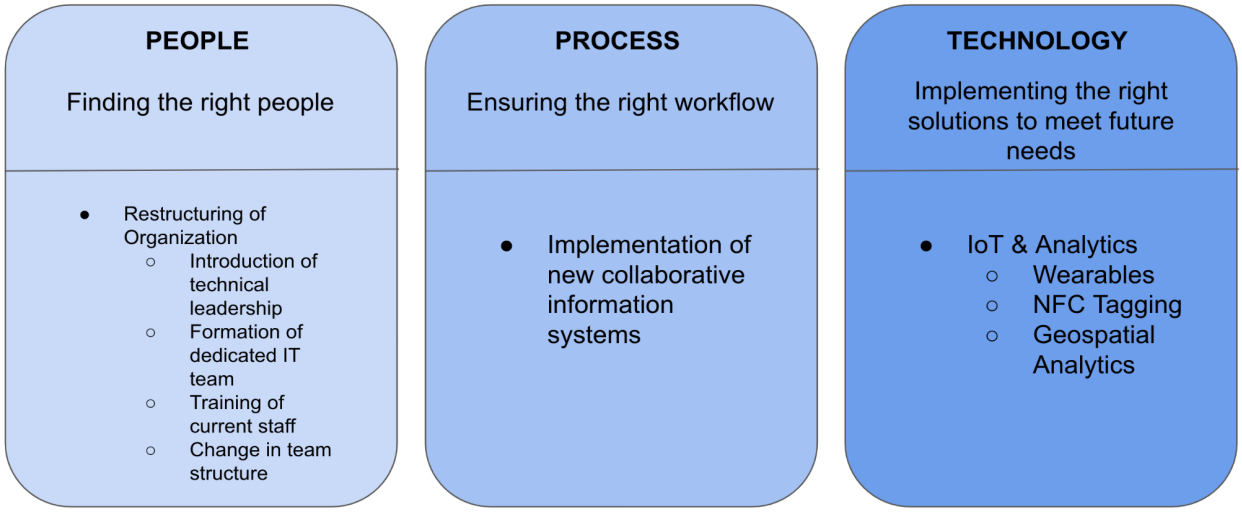


Figure 6: Three core competencies of a value-centric IT Organisation

4.1 Internet of Things (IoT) and Analytics

Internet of Things (IoT) is the vast amount of physical objects and devices that are connected to the web and are able to collect data. IoT is an increasing trend in the industry with its market size reaching about $19,000 million in 2027, from about $8,000 million in 2019, growing at a CAGR of 14.0% from 2020 to 2027[9]. As construction projects are experiencing increasing complexity and scale, numerous valuable data points from various aspects of the project's life cycle ranging from the supply-chain to onsite data can be gathered. By using IoT in RVRJ's processes through their equipment, structures and materials, the company can obtain valuable data required to improve RVRJ's Corporation processes.

4.1.1 Wearables

One IoT technology that RVRJ Corporation can use are construction wearables. We recommend RVRJ to equip their construction workers and project managers with these wearable technologies that can not only aid the workers in the work but also allow the collection of useful onsite data.

Wearables that RVRJ can implement are smart boots such as SolePower (Figure 7). These boots are embedded with various location, pressure and motion sensors that are able to send alerts to site managers whenever a worker experiences a fall. Furthermore, inertial measurement unit sensors, sensors that identify the body's angular rate and orientation, in the boots are also able to identify workers that may possibly have fatigue. The data obtained are also live and can be made readily available to onsite managers.

Figure 7: Features of SolePower's smart boot

On top of smart boots, there are a wide variety of possible wearables that RVRJ can equip their workers with. Examples include smart vests, which have a range of sensors (Figure 8) that are able to detect different metrics such as body temperature and impact. All of these wearables are able to deliver quick and useful data that allows the company and especially the site managers to monitor and manage workers to ensure greater onsite safety and efficiency.

Especially when dealing with large construction projects, site managers have to concern themselves with the well-being and safety of many workers. The implementation of such wearables can not only allow site managers to easily manage and prevent possible safety mishaps but also attend to such incidents quickly should it occur. Moreover, data gathered from these wearables over a long period of time, can be used by the management team to identify and reduce dangerous practices and accurately predict possible safety measures to apply for new projects.

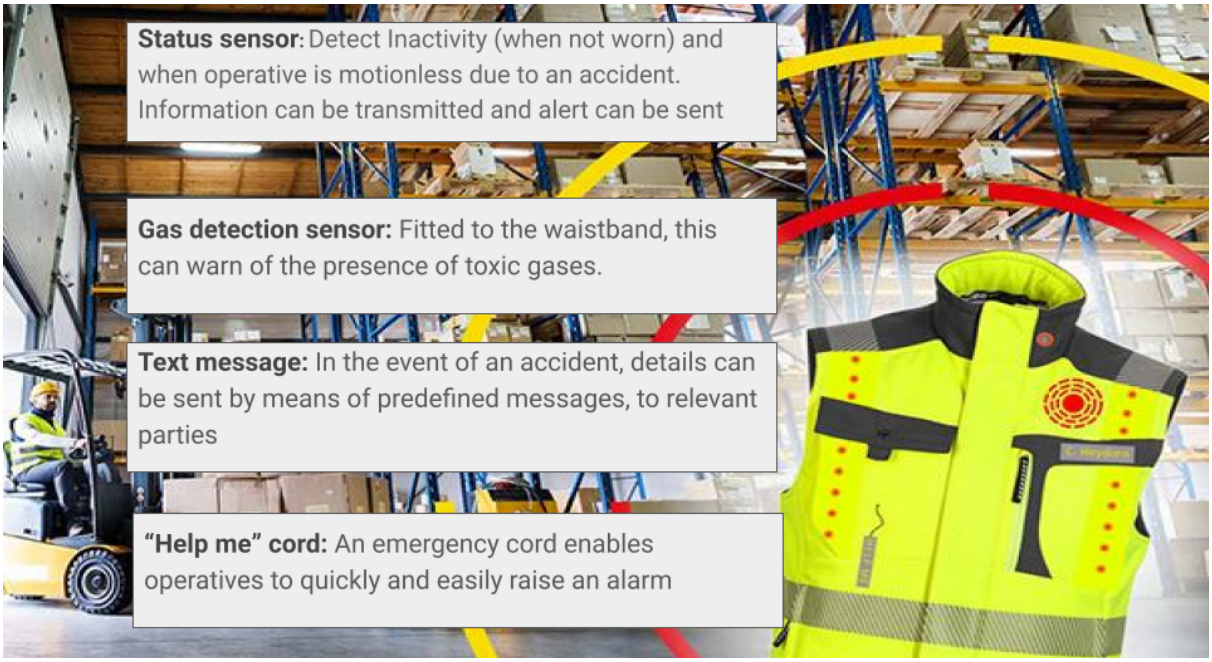


Figure 8: Example and features of a smart safety vest (LogiMAT) for construction workers

4.1.2 Near Field Communication (NFC) Technology

Another IoT technology that RVRJ Corporation can tap on to manage risk and build trust in partnership is NFC technology. We recommend RVRJ to use advanced NFC IC technology (Figure 9) to secure visitor authentication.

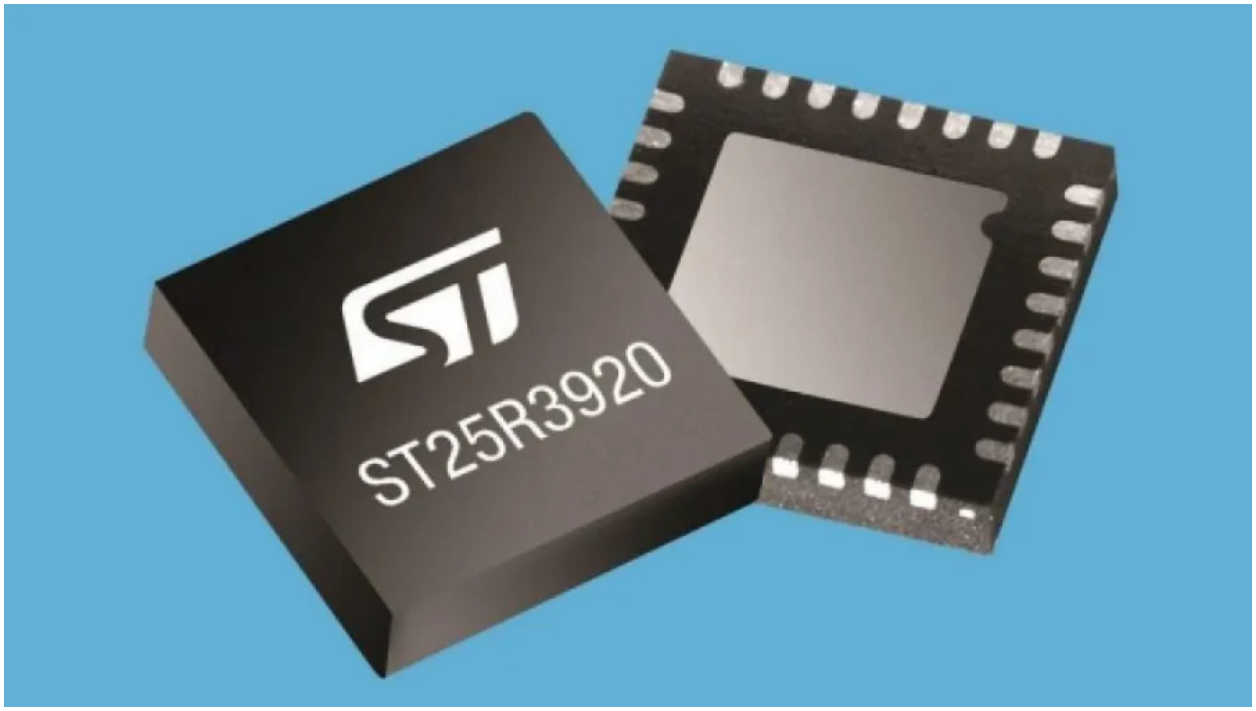


Figure 9: Example of NFC IC technology[10]

The advanced NFC IC technology allows secure visitor authentication by proving of physical tag presence. Personnel who are not working under RVRJ, such as the subcontractors, can build a new level of trust with an auditable tag presence. Subcontractors can tap on this technology to report the exact hours on ground, building trust in the partnership as exact time stamps can be shown. The secure data logs is also a great way for RVRJ Corporation to manage risk as the registered maintenance information can be used when there are disputes with its subcontractors.

The implementation of the NFC technology can be further extended to RVRJ Corporation's employees to keep track of location of its employees, number of employees on sites and other information.

4.1.3 Problems Addressed

RVRJ can harness innovations in the IoT to enhance the communication between different parties in the company who are and monitor the working conditions of equipment. Furthermore, IoT-enabled devices can ensure accountability and safety of on-site workers, providing an effective solution to potential lapses in safety in the corporation.

4.2 Introduce New Information System (IS) Infrastructure

RVRJ Corporation can introduce BIM Collaborate Pro (Figure 10) as a collaborative tool for its business operation to resolve the problem of the lack of collaborative tools and low productivity.

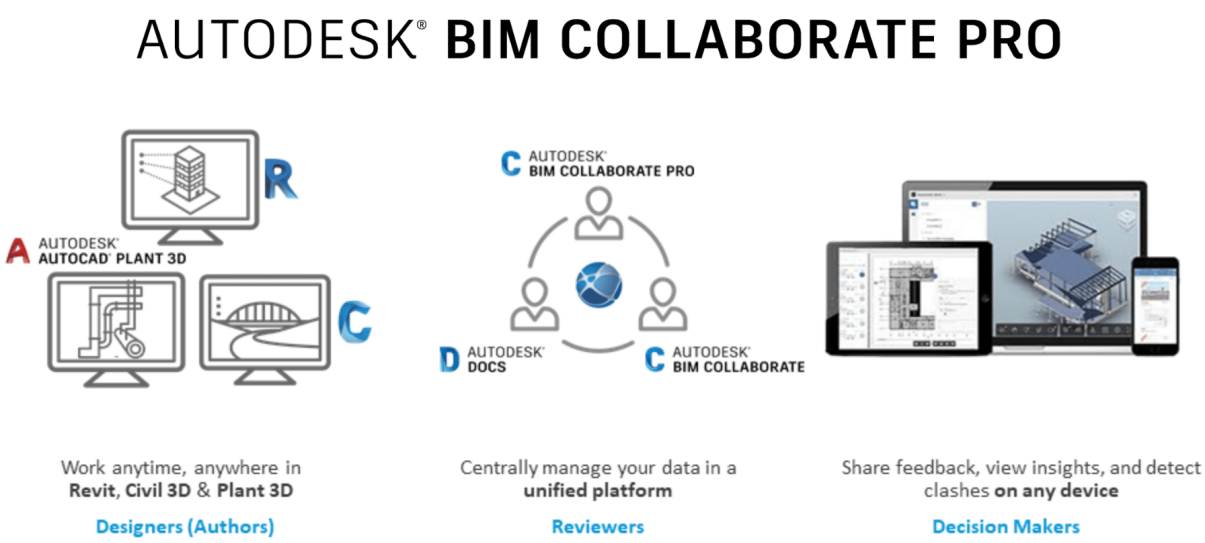


Figure 10: Functions of BIM Collaborate Pro[11]

BIM Collaborate Pro is an existing cloud-based design coordination and collaboration software that connects the Architecture, Engineering and Construction teams. It aims to help construction companies to carry out on design intent and provide high-quality constructible models on a single platform. The platform provides easy feedback tools - improving the communication between teams, live design co-creation - accelerating the timelines, and better construction documentation - reducing rework, RFIs and change orders. This thus allows business units to coordinate by sharing their files and data more efficiently.

4.2.1 Problems Addressed

RVRJ Corporation can introduce BIM Collaborate Pro to provide an environment where various business teams can communicate ,share documents and add to the workflow of projects across digital space. The rise in a seamless workflow reduces delays in data transmission across business units, increasing the productivity and efficiency of its IS infrastructure.

4.3 Integration of BIM with Augmented Reality

To improve the productivity of RVRJ Corporation's processes, RVRJ can tap into the usage of Augmented Virtual Reality (AR), a computer-generated environment with scenes and objects that appear to be real to support its business processes.

Figure 11: VisualLive AR Software[12]

By using AR software such as MobileLive from VisualLive, construction engineers are able to superimpose their digital CAD and 3D BIM Models onto the physical environment and location where the construction will take place (Figure 11). This is particularly beneficial to the construction process as it is able to allow the engineers to detect discrepancies in their digitally modelled designs when imposed on the actual space, and henceforth rectify these mistakes before the construction work is carried out.

VisualLive is also able to engineer two aspects of BIM visualisation, Electrical and Mechanical Systems Modelling (Figure 12).

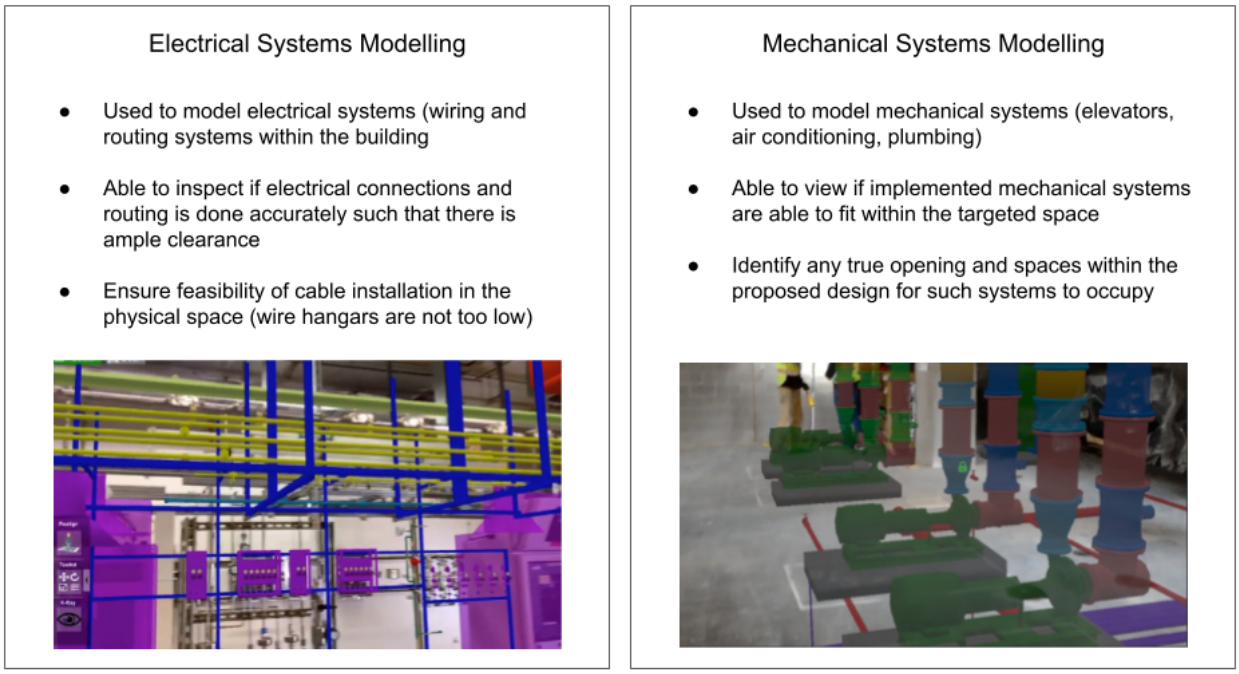


Figure 12: VisualLive Electrical and Mechanical Systems Modelling[12]

4.3.1 Problems Addressed

The usage of the AR technology helps to minimise and prevent costly mistakes in design from making it to the construction and development phase, allowing RVRJ to cut down on the time wasted from the rectification and re-implementation and increase the productivity of their projects.

4.4 Organisational Restructuring

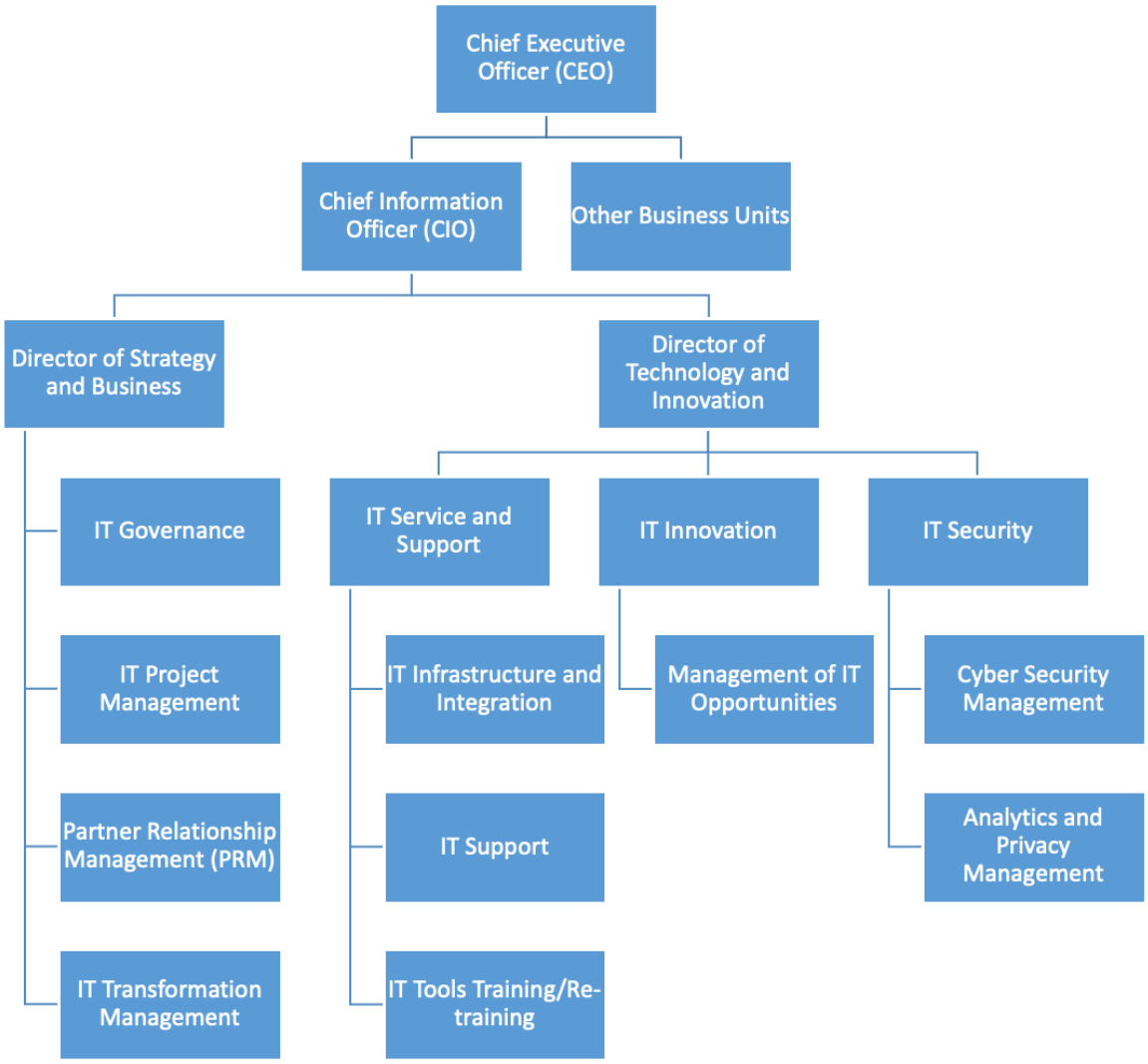


Figure 13: Proposed Organisational Structure

We propose that RVRJ Corporation undergo a complete organisational restructuring to incorporate primary stakeholders and departments responsible for the company's IT operations (Figure 13). At the core of the restructuring is the hiring of a Chief Information Officer (CIO) with a rich background in IS management, technical integration of IT and business innovation to oversee all of the company's IS responsibilities and digital initiatives. The technology unit will be divided into two main departments: Strategy and Business, and Technology and Innovation. They will be headed by two directors highly experienced in their specific fields.

4.4.1 Strategy and Business Arm

This arm includes:

Role	Responsibility
IT Governance team	● Set clear guidelines for the rights of end-users ● Ensures accountability of all stakeholders ● Ensure that IT is utilised desirably and appropriately
IT Project Management Office (PMO)	● Assess and select appropriate IT initiatives from a range of generated solutions ● Task organisation activities ● Communicate with other business units on IT plans
Partner Relationship Management (PRM) team	● Digital innovations in managing customer, employee and supplier relationships.
IT Transformation team	● Generating other technical solutions that align with RVRJ's business strategy ● Concentrating the IT development effort ● Ensure that the company stays focused on implementing the latest developments in IT in its business operations

4.4.2 Technology and Innovation Arm

This arm includes:

Role	Responsibility
IT Service and Support department	● Consists of highly trained in the technologies required in digital transformation projects while taking budget and time constraints into account ● Transform existing IT infrastructure, and maintaining the new infrastructure on a consistent basis as new technologies emerge ● Provide extensive support for end-users to ensure that IT tools are utilised to their fullest extent ● Develop training programmes for users to familiarise themselves with new technologies
IT Innovation department	● Technical deployment of digital innovations in the companies to gain a competitive edge over the firm's competitors ● Allocate the appropriate financial and human resources necessary to realise these innovations
IT Security department	● Identify and eliminate cyber threats to any of the company's IT implementations ● Manage users' privacy rights and data sharing.

4.4.3 Problems Addressed

The complete organisational restructuring addresses the issue of inadequate IT leadership in RVRJ, and will improve the company's integration of IT into its day-to-day operations.

5. Implementation Plan

5.1 Implementation Timeline

The implementation of RVRJ's digital transformation strategy will be done in three phases, namely establishing a strong strategic expertise, implementing basic workflows and introducing new innovation (Figure 14). The timeline is planned in a manner for RVRJ Corporation to first build a strong technical expertise and leadership foundation to lead the transformational change, and have a standardised workflow before implementing the new technologies. This ensures that RVRJ Corporation and its employees have the capability to welcome the changes and enjoy the benefits that these changes bring fully at every phase.

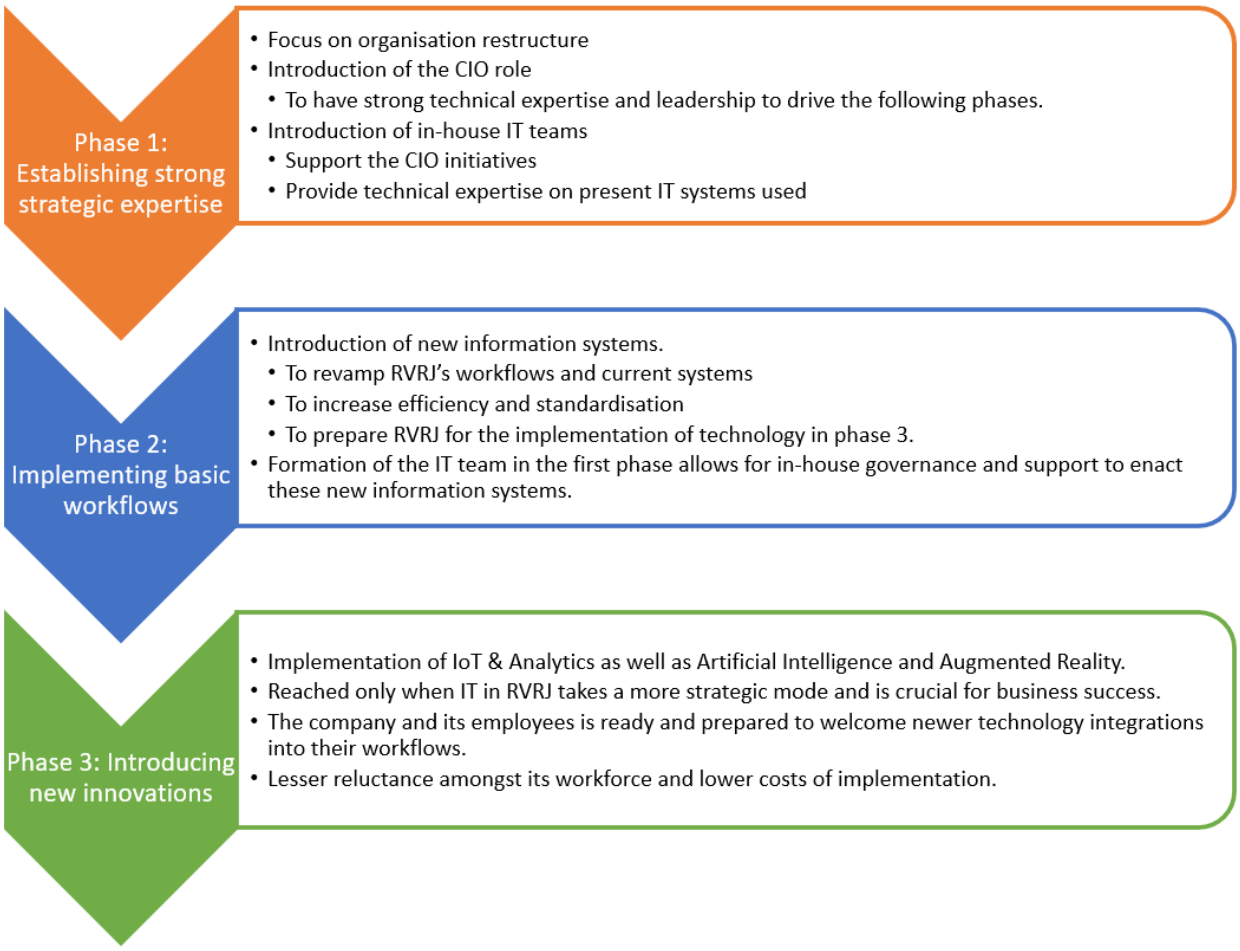


Figure 14: Illustration of the three phases of implementation

6. Feasibility Assessment

6.1 Implementation of IT solutions

The feasibility assessment of the implementation of IT solutions proposed (Wearables, NFC Tagging, AR and BIM Collaborate Pro) is done based on the economic, technical and operational feasibility.

6.1.1 Economic Feasibility

Technology	Wearables	NFC Tagging	AR (MobileLive)	BIM Collaborate Pro
Cost	~ $130 / wearable	~ $ 3 million	$ 2,088 / year / device	$ 1,272 / year

Figure 15: Cost of implementing the IT solutions

The cost of implementing the proposed IT solutions is high. However, our team believes that with the benefits that the IT solutions brings to RVRJ and by following the proposed implementation timeline, it will be economically feasible for RVRJ to implement the solutions.

6.1.2 Technical Feasibility

As all the proposed IT solutions will be outsourced from third-party providers, the implementation and maintenance of the IT solutions is not on RVRJ's side. Furthermore, with a strong IT team build in phase 1, the team can support the implementation by providing their technical expertise if necessary. Hence, our team does not foresee any technical difficulties during the implementation.

6.1.3 Operational Feasibility

Though there may be reluctance amongst employees to pick up the required skills for operating these IT solutions, our team believes that the benefits and the IT itself will appeal to the employees. Furthermore, the IT solutions that our team has proposed are easy to operate and are similar to the current ITs in RVRJ. Hence, there would not be a steep learning curve for the employees. Therefore, we do not foresee huge operational difficulties in the implementation.

6.2 Organisational Restructuring

After a thorough analysis of the possible organisational structures, we concluded that a functional organisational structure was most appropriate and feasible for RVRJ Corporation. It is one where team members are organised into departments based on their skill sets and experience. The benefits include employees fitting into their roles better as they dedicate most of their time to mastering their specialisations and greater focus and efficiency in completing tasks due to the specialised departments. The drawbacks include stifled efficiency in cross-department collaboration on projects due to communication barriers and inhibited innovation and teamwork due to traditional rigid hierarchical structures. Given the novelty of IT integration into RVRJ, teams consisting of individuals with highly specialised skills sets would complete tasks quickly and effectively.

7. Change Management Plan

The results of a stakeholder analysis can be seen in Figure 16. The changes proposed will have a significant impact on the key stakeholders of the company, namely the CEO, CIO and the IT and Operations managers of the company. They will play a pivotal role in ensuring the smooth roll-out of the proposed changes and oversee the transition of the company from traditional processes.

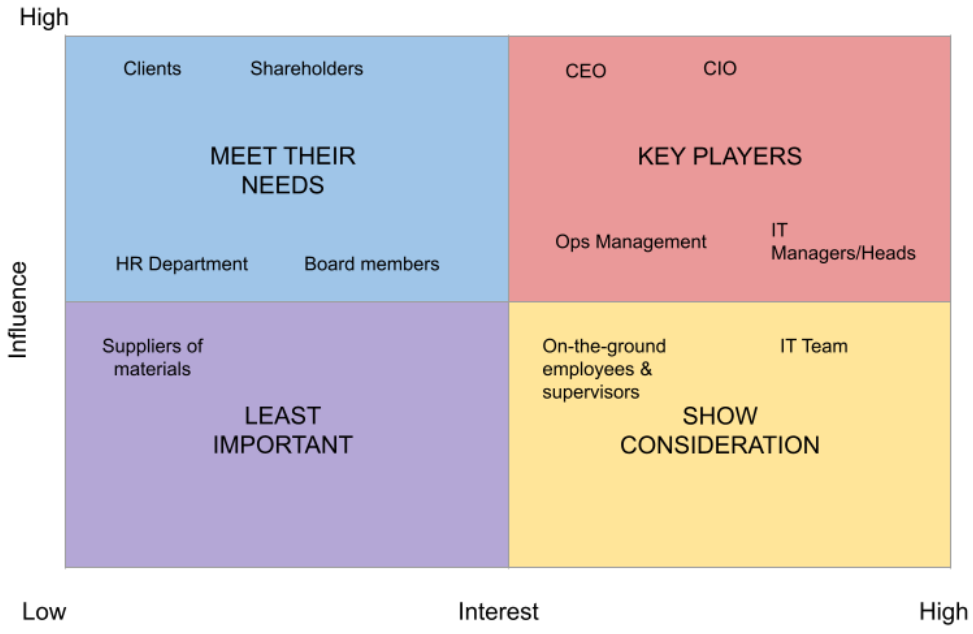


Figure 16: Stakeholder analysis

RVRJ will be implementing the proposed changes through a six-step process (Figure 17). First, it is to create the climate for change by raising the need for change to the members and upper management of RVRJ. Then, a clear vision is generated together with key stakeholders (CEO, CIO), along with a concrete strategic plan to achieve that vision. Next, communicating the change and vision by setting up communication channels to gain support from employees and clients. This support will accelerate the transitioning process and maintain a level of trust throughout the change effort. Afterwhich, existing obstacles to the proposed changes should be removed. Employees should also be encouraged to take risks and explore new ideas and activities, to further improve on the strategic plan. Next, generating short-term wins by setting short-term goals to validate the feasibility of transformation and motivate the organisation to implement more of the proposed changes. Changemakers should also be rewarded for their effort to encourage them to continue to work hard to realise the transformational changes. Lastly, sustaining change by using the increased credibility to overhaul all the systems, structures and policies that do not align with the change vision. In the long run, the success will also encourage RVRJ to rethink how it manages its leadership and productivity-related tasks. With sounder and more efficient management, RVRJ will adapt to paradigm shifts in the industry and maintain its competitive edge by embracing the future.

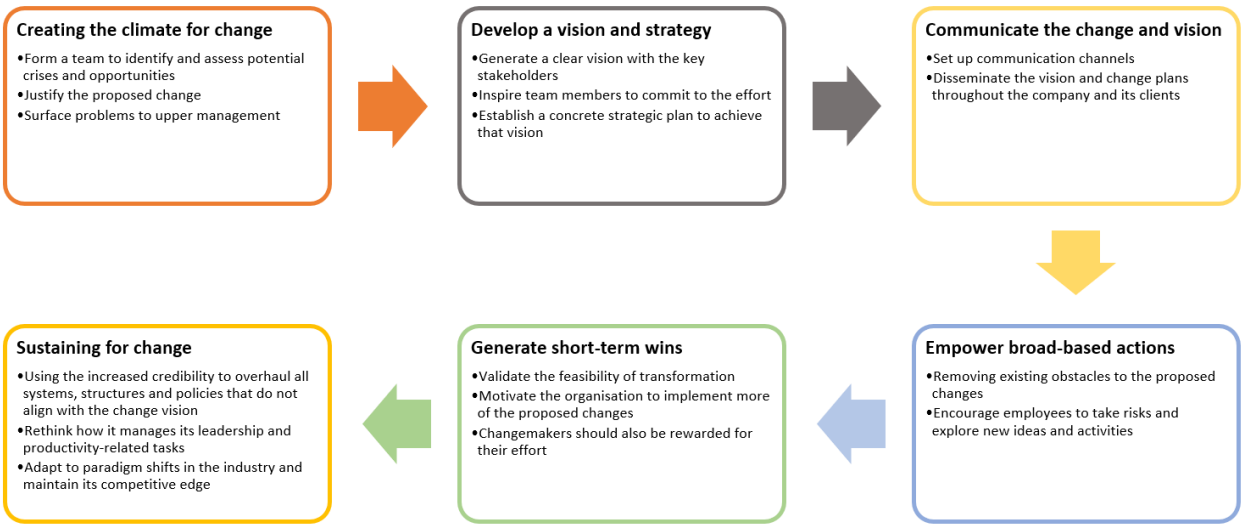


Figure 17: 6-step Change Management Plan

8. Expected Benefits

8.1 Benefits from proposed solutions

The changes proposed are expected to solve most of the challenges RVRJ has been facing (Figure 18).

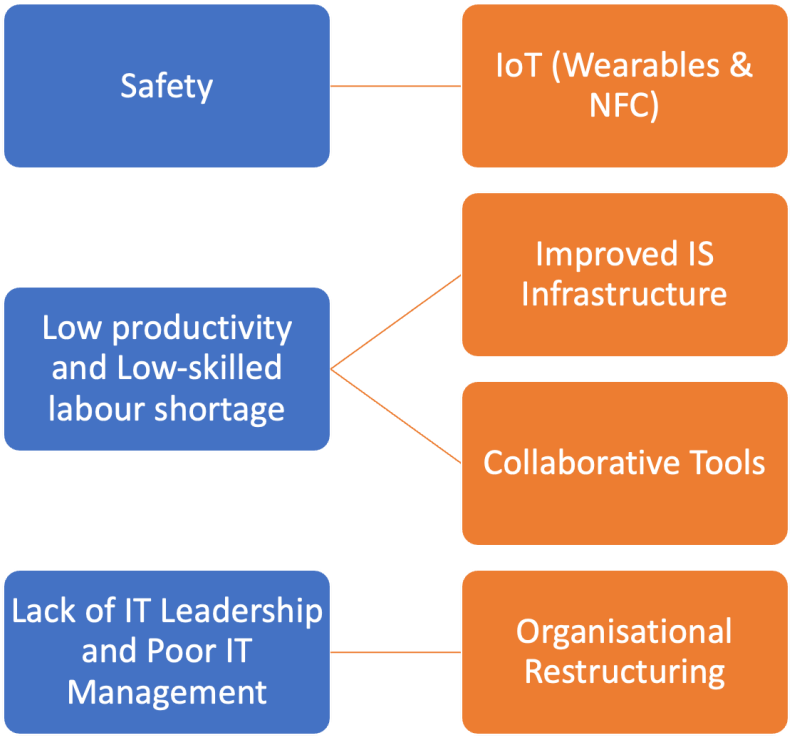


Figure 18: Benefits of solutions

Implementing IoT-enabled devices will greatly improve on-site safety and accountability. An improved IS infrastructure and a revamp of the company's collaborative systems will solve the issue of poor technology management and its low productivity. Remodeling the organisational structure of RVRJ will solve the challenge of poor IT governance and facilitate the smooth roll-out of the proposed solutions.

These improvements will also reduce RVRJ's labour requirements by improving the efficiency of processes, solving its challenge of a shrinking low-skilled labour force. However, RVRJ has to shift its focus to expanding its high-skilled labour force who are adept at operating these new technologies through constant training and re-training efforts.

The increased efficiency of processes also helps to solve the challenges resulting from Covid-19, by reducing the time spent on a construction project and minimising the unnecessary costs incurred.

Word count: 4973 words

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