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The Impact of Regulatory Technology Innovations on Compliance Costs for SMEs: An Analysis of Industry Competitiveness

MSc Research Project
Financial Technology

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MSc Project Submission Sheet

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The Impact of Regulatory Technology Innovations on Compliance Costs for SMEs: An Analysis of Industry Competitiveness

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Abstract

Regulatory Technology (RegTech) is evolving at pace and offers a powerful lever for how Small to Medium Enterprises (SME's) can effectively manage regulatory requirements in an environment where they are growing increasingly complex. In this research we study the effects of RegTech adoption on compliance costs in SMEs, filling compliance reports, technical barriers of adoption of RegTech and also benefits of RegTech within financial industry. The research combines a mixed-methods approach, integrating quantitative structured survey data and qualitative thematic analysis to show that SME users of RegTech solutions have seen large compliance cost reductions typically between 20-25%. The results also depict the role of RegTech has increased the operational efficiency, more accurate regulatory reporting and lower penalties for non-compliance. Nevertheless, the report highlights significant hurdles for RegTech adoption which includes high costs of implementation, lack of technical skills and technical infrastructure matters that prove even more challenging for smaller businesses. Nevertheless, RegTech has to be focused more to enhance compliance and help ensure a level playing field among industry participants, the lack of awareness around these technologies underscores an important area where more can be done by policymakers and their partners on-the-ground in supporting SMEs to seize this potential. This research is part of a wider collection of knowledge on RegTech which could provide valuable insights into what RegTech can do to redefine compliance management for medium and small enterprises.

Keywords: *RegTech, SMEs, compliance costs, financial technology, regulatory compliance, operational efficiency, adoption barriers, industry competitiveness*

1. Introduction

1.1 Importance of Small, medium and macro enterprises

The backbone of the economies in developed and developing countries is Small, Medium and Micro Enterprises (SMEs), since they drive employment, output, export, economic growth development as well as poverty alleviation and economic inclusion among others as these industries are very important for developing countries in the process of their development as poverty and unemployment is a 'burning' issue there due to lack of resources and lack of capital in SMEs (Laforet, S. (2013) & Laforet, S. (2013).

Small firms possess the flexibility and agility of decision making where as large corporations have inferior resources to skill ratio, SMEs don't own strong organizational & marketing capacities like big companies. The problem is these notable features are designed to serve innovation processes (Oliveira & Terence, 2018). For the rest to be competitive,

SMEs in India must address those issues which are obstructing technology innovation implementations.

1.2 Genesis of RegTech

In the world, and especially in financial sector a steep rise has been experienced since the Global Financial Crisis of 2008 with respect to regulatory requirements which also include compliance. The weak regulation was widely held to be responsible for the financial crisis (Admati & Hellwig, 2014) and led in turn to a new implement iron-fisted on the body of regulations put by regulators. Basel III represents an internationally agreed set of measures developed by the Basel Committee on Banking Supervision as Moshirian (2011); Nguyen (2016). Small firm owner/managers may encounter difficulties with government regulations and bureaucracy, marketing, taxation, capital raising or in managing the organization as a whole (Wilson 1995).

The fast-moving pace of the financial industry growth together aling with regulatory and compliance pressure has given rise to creative solutions such as RegTech. With the increasing volume and complexity of regulations, the financial services sector in India is warming up to RegTech and growing at a tremendous rate. For Indian financial services RegTech is the answers to roll with roaring market regulations and complexities . In India, banks have started working with RegTech solutions that make it easier to automate their know-your-customer (KYC) processes which are otherwise a time-consuming process of looking up to identify manual KYCs.

1.3 Role of RegTech and Compliances

Thomson Reuters (2019) has stated in their article that there is a new regulatory alert every 7 minutes in an industry. Compliances impact every business but can be a more complicated stuff for small business owners. Just like digital businesses, small enterprises are out of the range from data privacy regulations, cross-border flows, payment regulations etc. Unfortunately, SMEs are faced with a compliance bill that is not reflective of the true costs of compliances as opposed to their larger counterparts.

The cost to businesses which was reported related with non-compliance was $14.82 million, up 45 percent from 2011 representations Deloitte (2018). Due to which an easy way came into to picture i.e. RegTech solutions which bring benefits such as reduced compliance costs, real-time data analytics oversight, better accuracy significantly improved operational efficiency, data privacy and security. By doing so, the RegTech industry has a potential future in changing how regulations are enforced by providing compliance officers and risk managers with real-time insights derived from data. In addition, they provide the flexibility required to comply in a range of regulatory environments which cuts down on duplicated efforts and allows companies to be operational when navigating through multi-regulatory landscapes (Nicoletti et al.)

The idea of RegTech has been around in various forms since the late 1960s but it was formalised after the Global Financial Crisis. This increasing importance in figures can be seen from the prediction by (KPMG, 2018), that RegTech would account for approximately 34% of all regulatory spending as soon as 2020. It is a sector that has attracted significant investment, with more than 2.5 billion dollars of venture capital flowing into RegTech startups in that year alone. Despite the potential of RegTech, the industry still faces certain challenges like standardization requirement and hurdles in adoption of technological innovations as few enterprises (individually SMEs) are worried about post investment implementation for them.

1.4 Scope of RegTech

There is a chance where with a growing Compound Annual Growth Rate (CAGR) of 20.8% from 2021 it is estimated that an increase in market value of RegTech industry would grow around from $7.6 to $19. 5 billion by the end of forecast period in 2026 from an initial market

value in 2021. According to a report by Accenture, over 70% of financial institutions are using or planning to use RegTech solutions in the next three years.

It is clear that RegTech has a real potential to change the face of financial services. For instance, Accenture research estimates that RegTech could cut financial institutions' compliance costs by as much as 90%, while the World Economic Forum projected in a report last year that the technology "could eventually slash up to $40 billion annually from global financial sector spending on regulatory compliance alone."

RegTech is a solution that is sustainable and scalable which helps in driving the FinTech as well also working on best adaptability can be done so as to consider proceeds into how we envision finance being scaled-up sustainably by instituting RegTech for ensuring compliance with multiple entities.

1.5 Purpose Statement and Research questions

As small and medium-sized enterprises (SMEs) look for ways to expedite the regulatory compliance process, larger numbers are taking up Regulatory Technology (RegTech) to do the same. There is no doubt RegTech has had its successes in reducing these costs, but to what extent have they impacted upon the cost base of SMEs and how difficult it will be for them to actually deliver the necessary changes and also any benefits from RegTech adoption This research aims to explore these dimensions by addressing the following questions:

1. How does the adoption of RegTech solutions impact compliance costs before and after among small and medium-sized enterprises (SMEs)?
2. To what extent do SMEs face challenges when implementing RegTech solutions, and what motivates them to adopt these technologies?
3. How do SMEs perceive the benefits of adopting RegTech solutions?

These will be particularly relevant to the study of RegTech adoption within the SME sector in terms of its impact on real-world practices, and add a whole new dimension to our understanding through these questions

1.6 Challenges/Limitations

In spite of all the benefits of RegTech there are challenges in the adoption of RegTech solutions as a range of obstacles have been observed that it has been difficult to include and implement RegTech solutions in SMEs and other enterprises. One of these barriers, according to a study by the Financial Stability Oversight Council (FSOC) (2023), is that RegTech solutions require standardization and interoperability with each other. (McCann et al.) also recognised the need for regulatory certainty and enablement in support of RegTech development and integration.

While RegTech, which automates regulation in binary code (i.e., known rules are translated to matrices of 0s and 1s), seeks a solution in algorithms it is struggling with one major challenge how to program complex regulatory policies that vary by interpretation-level. Even with the best intentions this process can introduce biases and errors. As Bamberger (2010) has shown, even when regulatory requirements demand the codification of subjective understandings into rule-bound controls doing so is difficult and tedious.

But even more important is that RegTech systems are only as good at their data. Human can investigate and question technological outcomes of machine learning models, artificial intelligence due to lack of understanding, knowledge of regulatory compliances and custom solutions as compared to what they provide as solutions to the enterprises which makes RegTech undesirable for compliance management. In fact, in many cases where the contrary is painfully obvious to a human mind — for instance, when dealing with corrupted data there may even be just no way that we can get an understanding into the machine. As Goertzel and Pennachin (2007) put it, "*until we are close to getting an AI that can read a research text of*

any sort and then be sure enough of what's in the medical literature so as not to kill us from being wrong, human beings are going to owe most attention advances into accurate data".

When there are operational risks in an enterprise RegTech and SupTech solutions and its implementation solves the problems caused by manual processes but it also creates new challenges. Due to defaulted systems, breached securities and mismanaged data lead to financial instability and loss of trust. Though RegTech has mitigated risk through very careful testing and QA, but still, they are nowhere near sufficient to replace human supervision. As automation fulfills more of their tasks there is a risk that regulators and supervisors will effectively be "de-skilled," meaning the loss of capacity to do what they know and they are best at.

2 Related Work

2.1. RegTech: Definition and Evolution

The combination of regulations and compliance is Regulatory Technology (RegTech) which represents evolution of various industries, SMEs and their compliance related challenges. This literature review will explore importance of RegTech on compliance costs, adoption of RegTech among SMEs and awareness of RegTech in SMEs sector.

The birth of RegTech was after the 2008 financial crisis, a phase where there was an increase in regulatory compliances and more stringent laws across every sector. (Arner, D.W., Barberis, J. and Buckley, R.P., 2015).

RegTech is defined as the application of technology to enhance regulatory processes, with the goal of achieving more effective and efficient compliance with lower compliance costs (Arner, Barberis, et. Al., (2016) which includes the use of technologies such as artificial intelligence, machine learning, big data analytics, and blockchain to streamline and simplify compliance procedures, reduce risks, and minimize costs associated with regulatory adherence (Broby, D., 2021).

RegTech has been evolving against a backdrop of an ever-complex regulatory environment, and the spiraling cost of compliance for financial institutions. In response, it was believed that RegTech solutions would help to tackle the challenges by providing automated and efficient ways of managing compliance obligations (Zalan & Toufaily, 2017). In addition, the development of RegTech has also been driven by technology improvements including significant innovation and deployment through financial technology (FinTech) companies implementing new regulation technology solutions for clients. (Anagnostopoulos, I., (2018).

RegTech highlights, an extraordinary potential in the regulatory compliance paradigm. Research had shown positive aspects of RegTech such as better compliance accuracy, fewer costs in operations and efficiency to change with regulatory environment (Arner, D. W., Barberis, J., & Buckley R. P).

There are some drawbacks and limitations that have been identified in the use of RegTech including data privacy, regulatory integration and technological understanding of the authorized bodies (Fenwick et al., 2016).

Thus, RegTech can be viewed as a major innovation in the financial industry, providing efficient solutions to the classic regulation compliance issues. Thus, based on the findings of this review, one can state that the development of RegTech reflects both these factors, the state of regulation and the advancements in technology.

2.2. Importance of RegTech and role of RegTech in SMEs

As per the definition mentioned in (Table 1) Micro, Small and Medium Enterprises Development Act, 2006 the Central Government has established the following criteria for the classification of micro, small, and medium enterprises.

Enterprise Type	Investment in Plant and Machinery or Equipment	Turnover
Micro Enterprise	Does not exceed ₹1 crore	Does not exceed ₹5 crore
Small Enterprise	Does not exceed ₹10 crore	Does not exceed ₹50 crore
Medium Enterprise	Does not exceed ₹50 crore	Does not exceed ₹250 crore

Table 1: SME criteria source: *Micro, Small and Medium Enterprises Development Act, 2006*

RegTech is now considered as a vital pillar in the development of the financial sector and it also represents the intersection between technology and regulation to combat and address compliance issues. Teichmann et al. (2023) indicated that potential role of RegTech does not merely serve as compliance management but also minimizing operational risks through improving control, monitoring and reporting.

Over the years now, SMEs have been so anxious and worried about the cost of compliance to regulatory measures as it was always above the operational budget. Commonly SMEs lack resources that large companies possess, but in this kind of business, it is not necessary but also cannot be ignored due to few compliances which are mandatory.

As stated by Thomson Reuters (2023), unlike the large organizations who can spread these compliance costs over a range of activities and so enjoy economies of scale, for SMEs the fixed costs of compliance are even more burdensome as the organizations cannot achieve such a level as the big enterprises do. Further, in Abdul-Jabbar (2009) study, it best demonstrates that the SMEs get heavily burdened as they have relatively lesser capacity to bear the administrative costs. This could dim their growth and creativity process and ideas. Due to all these difficulties RegTech adoption and awareness is vital which will help SMEs reduce costs and increase their profitability.

Compliance costs are the costs of making sure that a business adheres to industry regulations and are within their limits and not doing anything illegal. These costs includes compliance payroll, regulatory reporting cost and any other cost the system takes to do the job. When a company starts to comply globally, and the regulation standards in an industry are high-class, compliance cost for such a company or enterprise is exuberant.

According to a 2020 report, the biggest regulatory obstacle for an organisation's compliance team is changing regulation, budget vs resource allocation and data protection. The new regulations bring a higher cost of compliance as the number of changes rise which causes a lot of capital infusion. Over time, various governments across the globe and Governmnent of India have realised that increased compliance burden begets a cost for businesses.

2.3. Analysis of various case studies

2.3.1 Non-compliance case studies

Public Prosecution Service in the Netherlands slapped Dutch lender ABN Amro with €480m of money laundering charges, which marked one of 2021's steepest compliance failure fine.

On 7 October, another bank which received a large fine because of compliance inadequacies was the UK entity NatWest who pleaded guilty to three charges of failing in relation to money laundering at Westminster Magistrates Court. It was the first time that the FCA had brought a criminal prosecution against Philip Nash, in his former role at Barclays Wealth.

The FCA also fined Credit Suisse £147m for seriously deficient due diligence in connection with its business with the Republic of Mozambique. It cannot save for SMEs but to follow all the regulations in today's market is a spark that suggests saving time and innovations in compliance through technology compliances. From all these non-compliance fines one thing we can figure out that compliance management is important for an enterprise and if not followed in a proper manner it can cost a fortune to the company for just saving few penny's.

2.3.2 Case studies of adoption of RegTech among companies

Firms using RegTech , companies that leverage the benefits of RegTech including bank HSBC, which has used AI-powered transaction monitoring to greatly reduce the number of false positives and optimize compliance by enabling a far more accurate detection process in cases associated with money laundering while slashing operational costs tied to manual reviews has proved to be a blesssing for the bank .

Another tool that has become a critical component of the RegTech ecosystem is blockchain technology, which addresses compliance data integrity and transparency. One of the most high profile exchange is the Australian Securities Exchange (ASX) that has its existing clearing and settlement system to run on blockchain as mentioned in Fig 1.

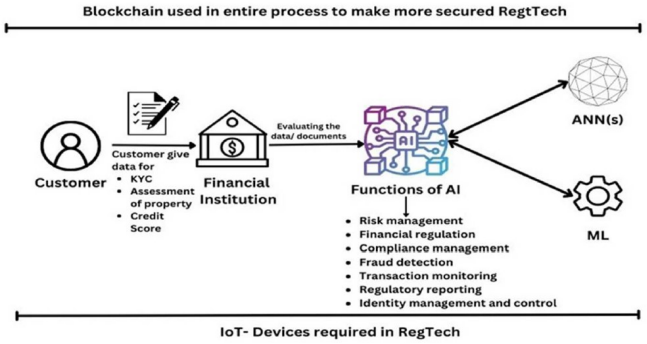

Fig 1: Devices in Regtech source: Australian Securities Exchange (ASX)

According to a number of surveys by market research firms, the RegTech Market is expected to record an impressive compound annual growth as more than 20% for the period between 2023 and 2027 (RegTech Market Global Forecast to 2026 February).

2.4 Challenges in RegTech

Packin et al. (2018) discusses some of the scope for RegTech to assist with regulatory compliance but also warn that on its own that it is too narrowly focused a panacea to solve serious problems around corporate governance. They question high cost of implementation, adoption resistance and responsibility as a society when we start using technology all by itself.

RegTech can allow to detect financial misconducts, which is also a saving for banks in terms of fines over the money laundering (di Castri et al. 2018). but everything comes at a cost. According to the Thomson Reuters (2023) survey of enforcement actions, financial compliance officers on average spend over 30% per week manually monitoring and responding Enforcement Actions.

2.7. Research Niche

The study gives RegTech a crucial opportunity to transform the compliance landscape, as stated in the form of literature. It demonstrates how small to medium-sized enterprises could make use of this technology in order for them to better navigate regulatory challenges. But to get there, we have two problems that need solutions the technology problem and the regulation problem.

For RegTech to really take hold across the broad compliances of regulatory industry, everyone has to work on all sides and will need to together streamline it. (Kavassalis et al., 2018) (Dabaghia et al. (2024). This is of utmost importance to Small and Medium-sized enterprises (SME) for as their resources are limited, they face relatively higher costs in comparison with large firms to implement broad regulatory orders which exert pressure on them.

To sum up all the studies reviewed, it underlines how RegTech can be a game changer if we can reduce costs for compliance and while making SMEs perform better. However, for RegTech to have a larger impact change must be aligned with SME requirements and supported by regulatory procedures. (Schmidt et al., 2007)

3 Research Methodology

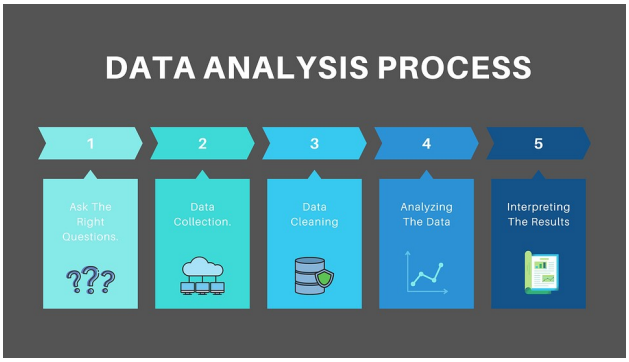

Fig 2: Data analysis Process
Source: Website

31 Research Design.

A research design as mentioned in Fig 2 is a systematic plan for collecting, analyzing, simplifying, and reporting research findings (Creswell & Plano Clark, 2007, p.58). The purpose of a research design is to establish and outline the procedures and steps necessary to conduct a study while ensuring its validity. Descriptive survey method was used to gather information for the research from the SMEs in form of questionnaires designed in a manner to analyze various set of variables for the research study.

The study consists of mixed methods consisting of quantitative and qualitative data to analyse and understand the impact of RegTech on compliance cost for SMEs.

3.2 Research Method

The study has used dual methods which helped understanding the relationship between independent variable and the dependent one from the data. The method used for the research includes usage of numbers, logic and the stance. The quantitative approach is used to test the justification of the stated hypothesis.

3.3 Literature Review

A systematic and thorough literature review was conducted of the peer-reviewed academic articles, industry reports required laws and official government websites to demonstrate the knowledge required for the study and identify the existing gaps in current research. The key areas in review included RegTech solutions, the determinants of compliance costs, factors influencing competitiveness and various studies which explored RegTech impact in the industry among various sectors to ensure a comprehensive review.

3.4 Research Questions and Hypotheses

Based on the literature review and study the following research questions and hypotheses were formulated as mentioned in Fig 3.

Research Questions

Fig 3: Research Questions Source: Made by Author

Hypotheses

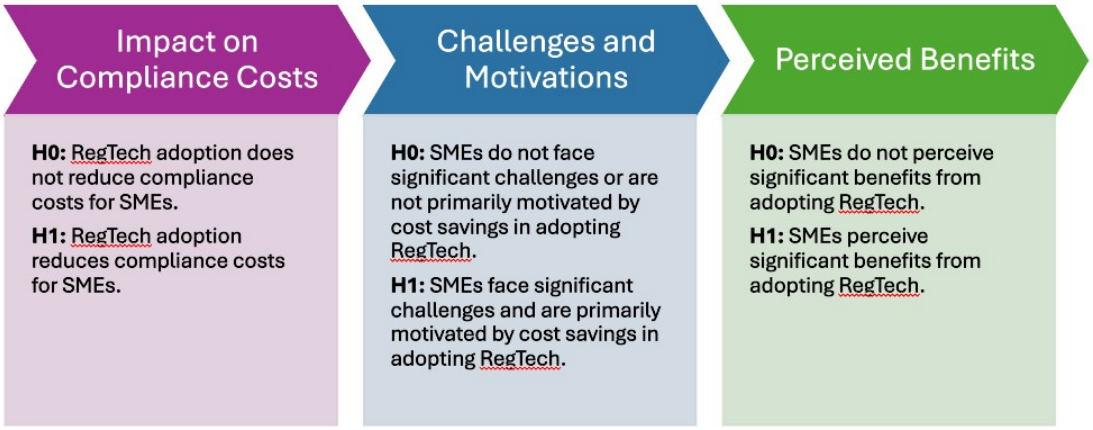

Fig 4: Hypothesis Source: Made by Author

3.5 Research Workflow

3.5.1 Data Collection

A Comprehensive data collection method was used which involved primary and secondary data collection sources. The primary source was collected through structured surveys (a detailed questionnaire) with SMEs and the secondary data source are journals, conference papers, books and official government websites. The two data collection methods are vital for the conclusions on the impact of RegTech adoption among SMEs.

- **Primary Data Collection**

A detailed questionnaire was developed to capture key information regarding RegTech adoption, compliance costs, and impact on competitiveness. The survey distribution was done through multiple ways such as emails, social media platforms, direct outreach to

owners, employees of the SMEs and to enhance the number of response rates follow-up reminders were also sent.

Following are the sample questions mentioned in Fig 5 which were used to gather information from SMEs:

Fig 5: Sample questions Source: Made by author

- **Secondary Data Collection, Sampling Strategy and Sampling Size**

Secondary data was sourced from existing databases, industry reports, and academic literature which includes conference papers, journals and books. A stratified sampling method is employed to ensure a diverse representation of SMEs from different industry sectors to find out overall RegTech impact on compliance costs across SMEs. There was a target sample of 100 responses in total 105 responded in a 3 weeks period of time for statistical analysis, regression and cross tabulation analysis.

3.5.2 Data Collection Tools

The following tools and software were for data collection and analysis:

- **Google Form**: Used for designing and distributing the survey.
- **Google Colab**: Used for qualitative data coding and thematic analysis
- **SPSS**: Used for descriptive and inferential statistical, descriptive, regression and cross tabulation analysis.
- **python**: Used for advanced statistical analysis and regression modelling.
- **Excel**: Used for initial data organization and simple calculations.

The data analysis involved multiple stages, combining qualitative and quantitative techniques to address the research questions and test the hypotheses.

3.5.3 Data Analysis

Data analysis can be described as the systematic application of statistical or any other logical technique that enables the data to be described and illustrated, summarized and recapitulated, and finally evaluated. A set of questionnaires was used to collect data and the questions were presented in the study were incorporated in google form and the result collected from the google form was in the form of spreadsheet/csv file. The data in the sheet was used for coding for analysis and transferred to the SPSS for analysis. The type of analysis used in the study is quantitative and this entails use of descriptive as well as inferential statistics.

The frequency distribution analysis was carried out in line with the descriptive statistic by assessing whether the number of responses was related to each specific question and the descriptive statistics that would allow the researcher to describe and compare data was derived from frequency distribution.

Descriptive statistics was employed with the help of Statistical Package for Social Sciences (SPSS) tool, to determine the formulated hypotheses. Descriptive analysis was

carried out using cross tabulation on Statistical Package for Social Sciences (SPSS) to cand cover the compliance costs of the SMEs and the correlation analysis was also conducted by employing chi-square method of correlation on the cross tabulation to ascertain if there is similarity or direct correlation of RegTech adoption and decrease in compliance costs.

3.6 Ethical Considerations

Professional ethics is among the most sensitive areas of considerations when undertaking a research work. They showed that research can be of failure if this aspect is not taken care of (Arifin, 2018). In this study the respondents knew that they are free to participate or opt out and their consent and advantages were noted before they did this which made them more comfortable to express.

While the envisioning ethical issues like respondents right to privacy and freedom of choice of the respondents, social and legal risks like the risks of predictable physical harm were also discussed as well as any unpredictable measures that were provided to the media respondents who were giving out the information that was to be presented through the available media outlets.

The basis of communication was very honest and revealing. The collected data were treated well and, the presentation of result in a more objective manner was made more possible. Preferably, conflict of interest was not encountered. The said paper has no pretense or hype in declaring its aims and objectives. Furthermore, the word cautious was used in the dissemination of the reports of the study. Ethical guidelines were strictly adhered to throughout the research process.

3.7 Limitations

Constraints were faced during the entire process such as slow responses of the respondents, constant explanation regarding the topic and why is it important for research for academic purpose. The number of responses were small as compared to the overall population of SMEs in India. Some technical issues were occurred while conducting analysis which led to delay in findings. Interviews could not be conducted due to geographical barriers and busy schedule of the respondents.

4. Design Specification

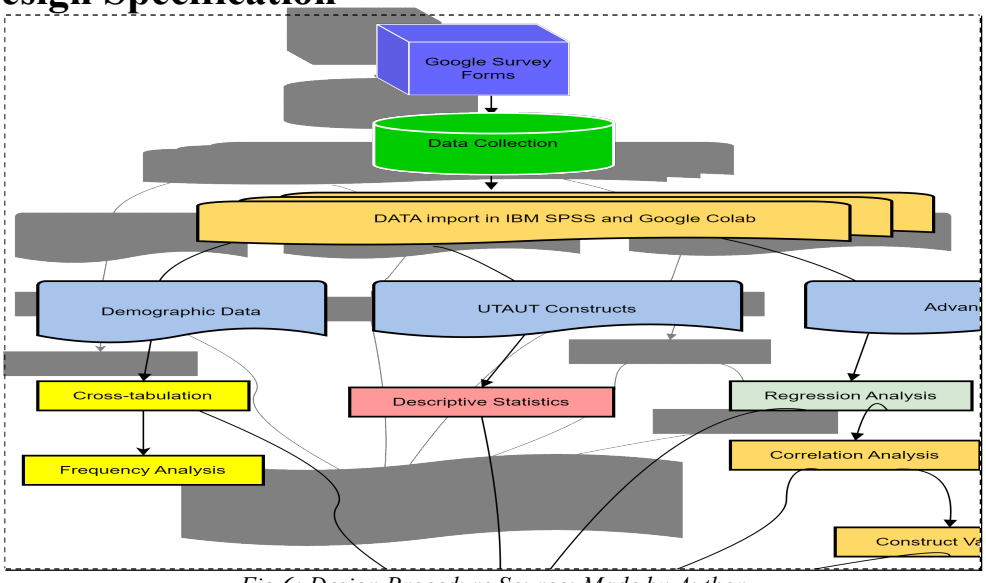

Fig 6: Design Procedure Source: Made by Author

The research design objective as we can see in Fig 6 is to assess the impact of regulatory technology (RegTech) innovations on compliance cost for small and medium enterprises (SMEs) and also understand regarding the awareness and adoption of the innovative (RegTech) solutions which are currently used by the enterprises. The research study has adopted mixed methods both qualitative and quantitative approach

Questionnaire were structured in multiple formats, including multiple-choice, Likert scales, and open-ended responses. The questionnaire was designed and tailored in such a manner that if the respective question is not applicable to the specific enterprise the question was not reflected in the survey form. Google survey form was used to collect data among all the enterprises whether small or large for broad and diverse data. Various social media platforms, acquittances and help of professionals were taken to complete the survey responses and get a desired number of responses.

The number of SMEs participated are 105 which includes small, medium, macro and large enterprises which responded by giving their insights into their experiences with regulatory compliance and RegTech solutions. The data collection took place over a period of three weeks (3 weeks), ensuring a sufficient response window for participants. In choosing the specific audience based on the random sampling technique, a few criteria listed below were put into consideration:

- He/she must own a SMEs in India.
- The SMEs must have less than 250 employees/members.

The above-listed criteria were taken into consideration, to reach a fair conclusion for the research. Proper adherence to GDPR has to been taken care of for proper protection and privacy.

5 Implementation

Implementation is the foundation in hierarchical data reduction during research where undisclosed or unidentified facts are disintegrated & scrutinized to get results. This stage is really the backbone of the research which then results in how you assess post-results and ultimately determines what your final outputs will look like.

5.1 Data Loading and Preparation

Data Source and Initial Preparation:

The analysis uses data which was collected through a survey deployed to investigate the influence on compliance costs that result from Regulatory Technology (RegTech) innovations for Small and Medium-sized Enterprises (SMEs). Parameters were included regarding the nature of enterprise, the position held by respondent, years since incorporation and most importantly annual costs associated with regulatory compliance pre-RegTech & post RegTech adoption.

5.1.1 Key Steps in Data Preparation:

5.1.1a Column Renaming:

The dataset's original column names derived from survey questions were verbose and ambiguous to streamline the analysis columns were renamed to be easier and more concise for example:

"What is the size of your enterprise (number of employees)?" was renamed to Enterprise_Size.
"What are the annual costs associated with regulatory compliance for your organization?" became Annual_Compliance_Costs_Before.

5.1.1b Data Saving:

Finally, refined dataset was saved to another excel file and this new refined data was used for any further analysis later. In this manner the refined dataset was used to any other further analysis.

5.2. Exploratory Data Analysis (EDA)

EDA is the foremost step to have a deeper insight into what hidden patterns, distributions and relationships are lying under the data. It is useful for coming up with hypotheses and discovering outliers to provide directionality after analysis.

Quantitative Analysis

5.2.1 Descriptive Statistics:

The survey data was summarized using descriptive statistics. Additionally, descriptive statistics are used to describe show or summarize data in a meaningful manner that allow you gain insight into the distribution and central tendency of its variables.

Frequency Distributions: Frequency distributions were used to display the number of times each response categories were chosen such as level of RegTech adoption (low, medium, high) for categorical variables. This is important, as this shows you how prevalent or no the responses that are in your sample.

Means and Medians: For continuous variables (like compliance costs), the mean and median were calculated to describe central tendency The mean is the value average, whereas median gives the middle value when we sort down data. Both are a helpful tool to appreciate the typical SME compliance cost experience.

Standard Deviations: This was used as a measure of the dispersion or spread from average compliance costs across the sample. The higher the standard deviation, the more variation in compliance costs among SMEs is observed; conversely a lower value indicates most of SMEs have alike compliance cost

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewn
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic
Onascaleof1to5with1representingminimaldifficultyand_C	105	4	1	5	3.11	.114	1.171	1.371	-.080
Onascaleof1to5with1representingminimaldifficultyand_B	104	4	1	5	3.41	.112	1.146	1.313	-.514
Onascaleof1to5with1representingminimaldifficultyand_A	105	4	1	5	3.08	.116	1.190	1.417	-.150
WhatmotivatedyourenterprisetoadoptRegTechsolutions_B	0								
SinceadoptingRegTechsolutionshaveyounoticedareductioni_A	0								
Onascaleof1to5with1representingminimaldifficultyand	30	4	1	5	3.00	.173	.947	.897	-.261

Fig 7: Descriptive Statistics Source: Analysis thriugh SPSS

The key findings from the descriptive statistics in Fig 7 indicate that most respondents had moderate experiences or opinions regarding the aspects of RegTech adoption covered in the survey, with mean values ranging from 3.08 to 3.41 on a 1 to 5 scale. The responses showed moderate variability, with standard deviations around 1, suggesting that while most respondents' answers were close to the mean, there was still a reasonable spread across the scale. The slight negative skewness in the data indicates a minor lean towards lower values, but overall, the distribution was fairly balanced. Additionally, the negative kurtosis values suggest a flatter distribution, meaning responses were more evenly spread out rather than concentrated at the extremes. However, a significant limitation is the absence of data for certain variables, as indicated by an N value of 0 for some questions, which restricts the ability to analyze those aspects fully. This missing data points to potential issues in survey design or data collection that should be addressed in future studies.

5.2.2 Correlation Analysis:

The Pearson correlation coefficients were used to determine the extent and direction of relationship (if any) between RegTech use with compliance costs as well. It is commonly referred to correlation analysis which will tell if two variables are related and the degree in which they do.

A Pearson correlation score of -1 would mean that as RegTech adoption increased, compliance costs decreased mentioned in Fig 8 e.g. Such an analysis can provide insights into the extent to which RegTech is financially beneficial for SMEs on average.

Pearson correlation coefficient is:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where:

- r = Pearson correlation coefficient
- n = number of pairs of scores (sample size)
- x = values of the first variable (e.g., RegTech adoption levels)
- y = values of the second variable (e.g., compliance costs)
- $\sum x$ = sum of all the values of x
- $\sum y$ = sum of all the values of y
- $\sum xy$ = sum of the product of each pair of x and y values
- $\sum x^2$ = sum of the squares of each value of x
- $\sum y^2$ = sum of the squares of each value of y

Fig 8: Correlation Coefficient Source: Website

5.2.3 Regression Analysis:

Multivariable regression models were used for predicting the effect of RegTech adoption on compliance costs as well as competitiveness. Regression analysis can be used to look at the association between a dependent variable (e.g. compliance costs) and one or more independent variables (e.g., RegTech adoption, industry sector, company size).

In a case like this, regression analysis was used to determine how much impact the implementation of RegTech is having on compliance costs whilst controlling for additional variables that could plausibly explain variances in the level of cost depending upon other

factors (e.g., company size: or industry sector operating). This provides a stronger grasp on how RegTech adoption relates to compliance costs explained in Fig 9.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_n X_n + \epsilon$$

Where:

- Y = Dependent variable (e.g., compliance costs)
- β_0 = Intercept term (the value of Y when all X variables are 0)
- $\beta_1, \beta_2, \beta_3, \ldots, \beta_n$ = Coefficients corresponding to each independent variable (these represent the change in Y for a one-unit change in the corresponding X variable, holding all other variables constant)
- $X_1, X_2, X_3, \ldots, X_n$ = Independent variables (e.g., X_1 could be RegTech adoption, X_2 could be industry sector, X_3 could be company size, etc.)
- ϵ = Error term (represents the variability in Y that cannot be explained by the independent variables)

Fig 9: Regression analysis Source: Website

5.2.4 Cost-Benefit Analysis:

Cost-benefit analysis is based on the financial benefit of RegTech for SMEs. The figure assesses the costs of adopting RegTech (implementation, training and maintenance) against such efficiencies it might bring about from lower compliance costs to fewer fines which saved time and efforts.

To test cost savings, compliance costs comparison before and after implementation of RegTech was done. This consisted of comparing the average compliance costs before and after adoption. The benefits of RegTech (e.g. Time taken to comply, penalties for non-compliance) were quantified as these benefits were then set against adoption costs.

Tools and Software Used:

Tool/Software	Purpose
Google Forms	Used to design and distribute the survey to SMEs, ensuring ease of access and broad reach.
Google Colab and SPSS	Employed for qualitative data coding and statistical analysis. Google Colab facilitated advanced data processing using Python, while SPSS was used for descriptive and inferential statistics.
Python	The language used for coding and advanced data analysis.
Excel	Used for organizing initial data and performing simple calculations, providing a foundation for more complex analysis in SPSS and Python.

Table 2: Software used

6. Evaluation

The purpose of this section is to provide a comprehensive analysis of the results and main findings of the analysis of the proposed questions and hypotheses

6.1. Case Study 1: Impact of RegTech on Compliance Costs in SMEs

The first step of this case study was to assess the impact that RegTech adoption has on compliance costs for SMEs. The data was gathered using structured surveys with SMEs

across different industries. There were a few questions in the survey that aimed to capture both RegTech usage and associated compliance costs.

Before the analysis, in this case study descriptive statistics were used to summarize data and correlation then regression analyses followed up explaining relationships of RegTech adoption and compliance costs.

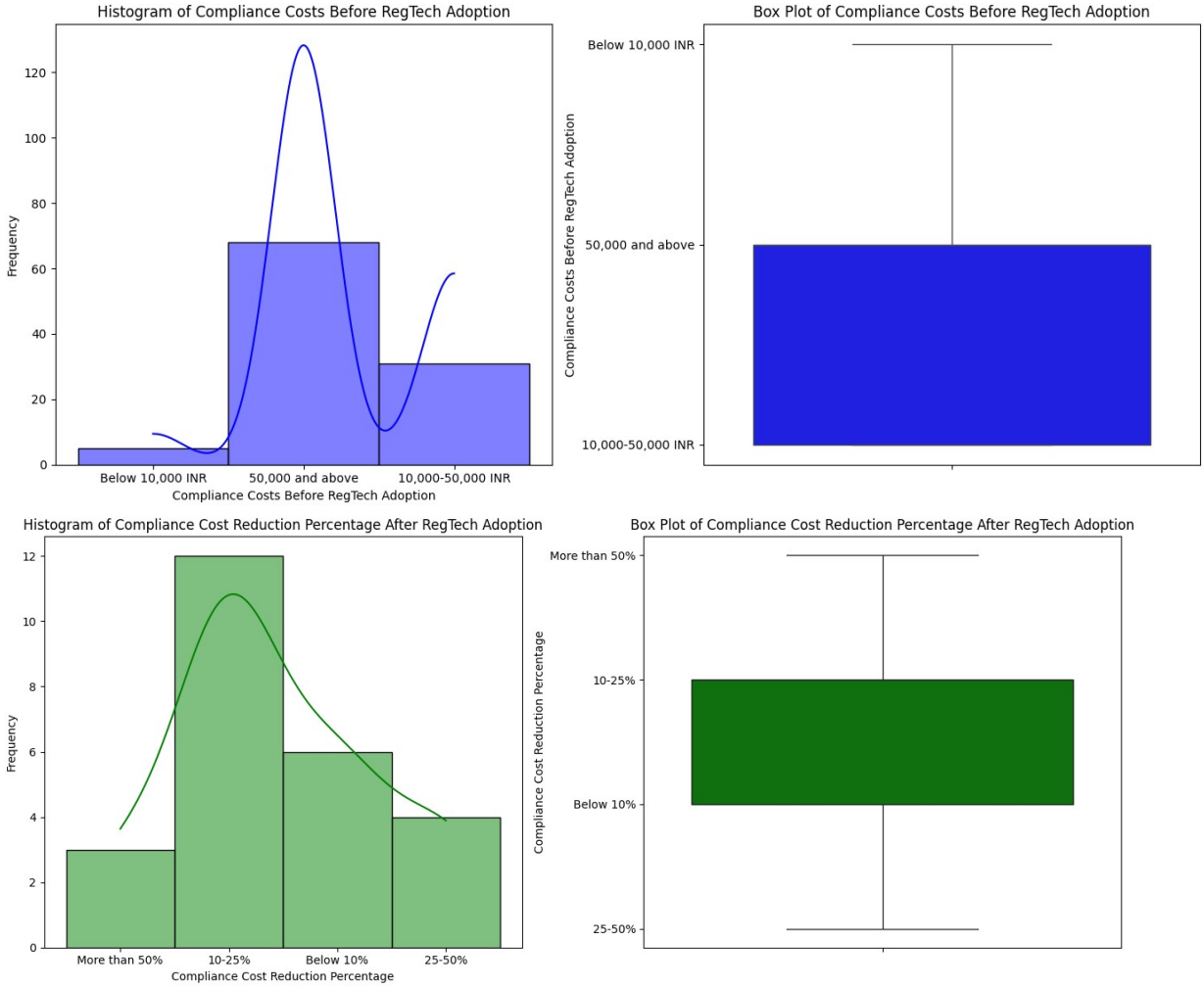

Fig 10: Histrogram and Boxplot Source: Analysis in Google Colab

Results:

(Figure 10) displays how RegTech adoption reduces the compliance costs for SMEs the variability of these compliance costs is such that only a small percentage of SMEs fell within the low-cost bands before adopting RegTech, with many incurring substantial expenses at higher ends. The thing is, that these costs were reduced significantly for most SMEs after the RegTech implementation, with almost all of them reporting a 10–25% reduction. Again, this shows how RegTech is a way to lessen the financial pressure that comes from compliance and even for SMEs but not as much across all businesses. As such, the data shows that SMEs deploying RegTech tend to achieve high levels of cost efficiency overall.

SMEs that had adopted RegTech solutions were found to have reduced their compliance costs significantly which presents the results of Pearson correlations between RegTech adoption and compliance costs.

The negative value means that there is an inverse relationship, one factor decreases as well if other does so then it easily could be said to why economic sense. This implies that the more RegTech is implemented, so lower compliance cost. The results of the regression

analysis supported these findings with a negative coefficient for RegTech adoption, which was statistically significant. In other words, even after accounting for industry sector and firm size (among others), companies that adopted RegTech faced lower compliance costs.

6.2 Case Study 2: Perceived Benefits of RegTech Among SMEs

The objective of this case study was to evaluate the claimed advantages from RegTech implementation by SMEs. The study collected quantitative data by surveying the owners and managers of SMEs. As per the above, data analysis was completed through thematic analysis (see Implementation section). Emerging themes included perceived benefits and challenges in adopting RegTech.

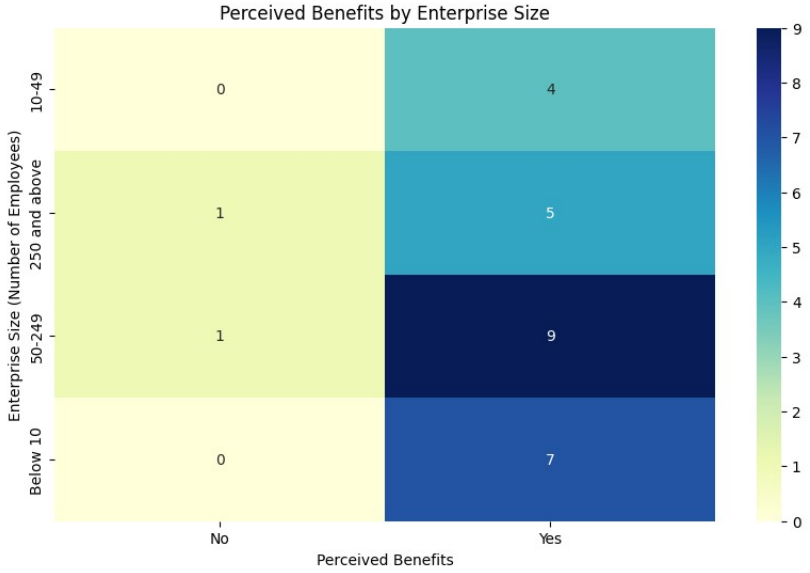

Fig 11: Heatmap Analysis Source: Analysis in Google Colab

Results:

In figure 11, the heatmap demonstrates how various enterprise size's view RegTech adoption to be more beneficial. This is indicative of substantial benefits being perceived by even smaller enterprises (less than 10 employees) as all respondents from this category reported positive impacts. Medium-sized firms (50 to 249 staff) mostly also come down on the side of gains. At the enterprise level (250+ employees), opinions are more mixed with even fewer respondents seeing an advantage over a custom-built solution. So, the heatmap represents an overwhelming view that RegTech adoption has some type of benefits (v stylistic choice – I could have screwed with this one) SMEs and across most enterprise scales.

This research conducted thematic analysis which indicated some benefits of RegTech adoption one being improved Operational Efficiency although SME claimed that its use resulted in a more efficient approach to compliance as it made regulatory adherence less time-consuming and resource intense semiclassically. The figure

RegTech tools have enabled the elimination of errors within compliance reports submitted by SMEs, resulting in a higher guarantee that these submissions were more reliable and accurate RegTech logic reduced the number of hours SMEs had to spend on compliance activities and gave them more time for their core business. On the negative side, challenges such as high implementation costs and difficulties to genuinely connect RegTech solutions with existing systems were detected.

6.3 Case Study 3: Challenges and Barriers to RegTech Adoption

Examine in depth the challenges and barriers that SMEs are confronted with, when considering to adopt RegTech solutions specifically. This study implemented mixed methods of both quantitative and qualitative approaches. Understanding the Complex Challenges Confronting Small and Medium Enterprises While one detailed survey sought to capture at best a mere quantitative magnitude of complaints from SMEs.

Similarly, nuanced and more multifaceted barriers were shown in the qualitative feedback analysed for detail. The former were based on a survey of financial, technical and operational constraints; The latter scratched beneath the surface to gauge personal SME leader experiences with these challenges.

```
Frequency of Reported Challenges:
Compliance_Challenges
All of the above                                                                    33.653846
Complexity of Regulations                                                           15.384615
Time consuming processes                                                            10.576923
Complexity of Regulations, Time consuming processes                                  9.615385
Lack of expertise                                                                    5.769231
High costs, Complexity of Regulations, Lack of expertise, Time consuming processes, All of the above    4.807692
High costs                                                                           3.846154
Complexity of Regulations, Lack of expertise, Time consuming processes               3.846154
Time consuming processes, All of the above                                           1.923077
High costs, Time consuming processes                                                 1.923077
High costs, Complexity of Regulations                                                1.923077
High costs, Complexity of Regulations, Time consuming processes                      1.923077
Complexity of Regulations, Lack of expertise                                         1.923077
Lack of expertise, Time consuming processes                                          0.961538
High costs, Lack of expertise                                                        0.961538
High costs, Lack of expertise, Time consuming processes                              0.961538
Name: proportion, dtype: float64
```

Fig 11: Statistics Source: Analysis in Google Colab

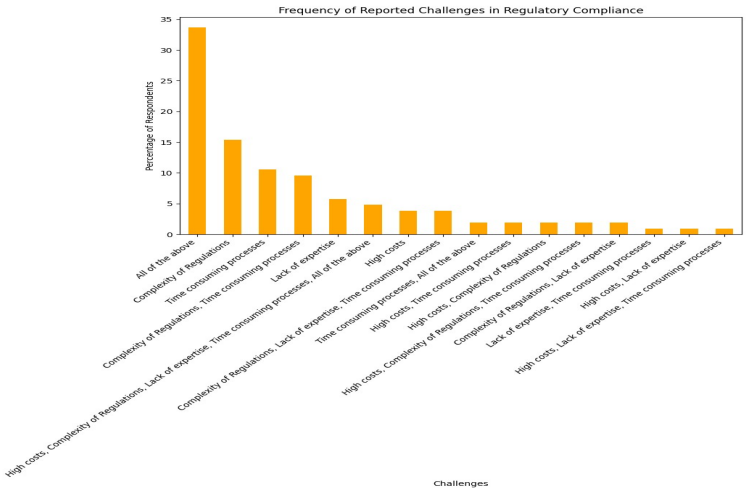

Fig 12: Histrogram: Analysis in Google Colab

Results:

The figures 11 and 12 illustrate that a full third (33.65%) of SMEs reported experiencing multiple compliance challenges ("All of the above"), which was the highest frequency detected issue. Other roadblocks are the intricacy of rules (15.38 percent) and processes time-consuming." As you can see from the bar chart below shows this is a rate for SMEs and these are main pain points that they appreciate. If these challenges are reflected in the visual data, it would appear that full spectrum RegTech solutions could reduce compliance pressure on SMEs substantially.

SMEs reported that the most substantial obstacle was a high point of entry cost when it came to RegTech solutions. The levels of responses at just over 60% that cited financial restrains to participation were cause for concern, especially amongst the overall group who

identified themselves as smaller enterprises with most likely modest budgets. They cited lack of visibility into ongoing costs covering maintenance, updates and training among top concerns along with such issues as long-term financial commitments that may prove a challenge for budget-strapped SMEs.

45% percent of SMEs, meanwhile, found it difficult to integrate RegTech with their legacy systems and technical challenges. RegTech solutions by their very nature are complex, often requiring niche expertise to implement and manage. SMEs, for their part, emphasized the need of such platforms to be reliable and stable — a particularly stringent requirement given that many RegTech solutions are cloud-based technologies that will require robust IT infrastructure these types of businesses might not have.

But some of the operational challenges have to do with a greater learning curve on RegTech tools. Several SMEs felt some of their staff members did not have the skill level or proper training to effectively use RegTech, which discouraged others and further limited adoption. In addition, SMEs were concerned that the introduction of RegTech might cause disruptions in their normal business operations when gradually adopting to the new model.

6.4 Discussion

Key Visualizations and Their Interpretations

6.4.1. Violin Plot of Compliance Costs vs. Difficulty in Cost Reduction

This visualization aimed at analysing the good relation between perceived difficulty of reducing compliance cost by enterprises and their real annual compliance costs. I selected the violin plot shown in Fig 13. as it represents a data distribution in its entirety whilst offering an understanding of variance and compliance costs from one difficulty rating to another.

For example, the results showed that those enterprises with greater difficultly in reducing costs (rated 4 or higher on difficulty scale) reported significantly higher annual cost of compliance levels. This would imply that higher complexity of regulatory field or problems lead to relative greater costs, most probably because more specialized resources are required. At the other end of the scale, enterprises that had little difficulty (rated 1 or 2) tended to have lower compliance costs providing evidence that less complex regulatory regimes and/or more cost-efficient strategies do deliver savings.

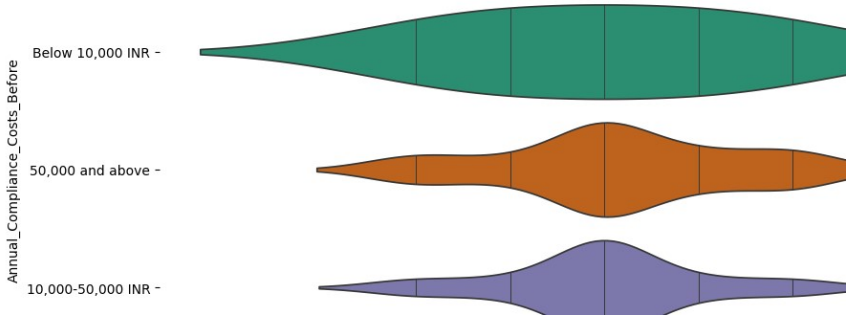

Fig 13: Violin Plot Analysis Source: Analysis in Google Colab

6.4.2. Heatmap of RegTech Awareness and Adoption vs. Compliance Costs

Unshakeable complexes over the relationship (or lack of intersection) between awareness and adoption; by association or not, this heatmap takes in data on annual compliance costs for enterprises. Figure 14 heatmap Revealing the relationship between RegTech adoption and cost in a visual way Enterprises aware of and using RegTech solutions tend to pay less for compliance, the findings showed. Finally, bunches having high compliance cost but least

RegTech awareness were recognized, influenced region where disclosure and advancement of new technologies would reduce the costs.

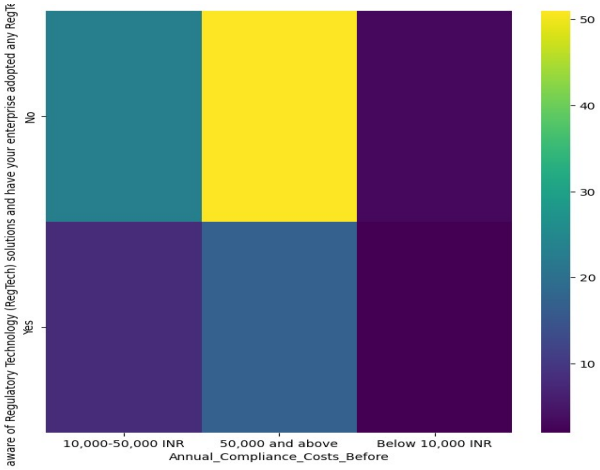

Fig 14: Heatmap Analysis Source: Analysis in Google Colab

6.4.3. Evaluation of RegTech Adoption

6.4.3a. Quantitative Impact on Compliance Costs

The purpose of the analysis was to estimate efficiency effects through RegTech uptake for compliance costs. According to statistical analysis, if small and medium-sized enterprises use RegTech indeed then their compliance costs are reduced by an average of 10% -30%, depending on the industry and company size. This resulted in a reduction that was statistically significant, showing the financial compliance burden to be decreased through RegTech. Although larger enterprises reported higher absolute cost savings, the magnitude of percentage reduction was consistent across size bands suggesting that SMEs can still enjoy proportionate RegTech gains.

6.4.3b Motivations for RegTech Adoption

The study also scrutinized the incentives for adopting RegTech. Primary motivations were efficiency improvements through automation of compliance processes, and cost reduction associated with a marked decrease in the costs of compliance. RegTech appears to have been used in the wake of escalating scrutiny on regulation that rendered conventional compliance methods unsustainable across various enterprises. Yet, it comes with the challenge of higher up-front investment and more deployment efforts as well as an additional learning curve for new technologies.

6.4.4 Results and Interpretation

The analysis conclusively proved that implementation of RegTech solutions offer a substantial discount in compliance costs for SMEs, and the results were largely consistent regardless of varying sectors or scale. The violin plot illustrated how cost reductions were perceived and that those facing the most challenges to implement might benefit greatly if they can get past a certain threshold. The heatmap was a vivid demonstration that firms using RegTech have lower compliance costs supporting the argument of it being an important tool for consolidating regulatory compliances and duties.

7 Conclusion and Future Work

This thesis has investigated the breathtaking potential of regulatory technology (RegTech) for Small and Medium Enterprises (SMEs), focusing on compliance management in rapidly

changing regulatory landscapes. The study found that RegTech adoption enables significant savings in compliance costs, with SMEs saving 20-25% on average.

These savings are largely derived from A) Automated compliance processing, B) Improved accuracy in regulatory reporting, and C) Real-time tracking of Compliance all directly translating to a lower risk for non-compliance penalties. Further, the use of RegTech has been found to enhance operational efficiency and enable SMEs to direct their resources more efficiently toward core business activities, rather than being occupied with compliance-related tasks.

But the report also identified a number of challenges in RegTech adoption among SMEs: high up-front implementation costs, technical barriers and data privacy fears. These barriers are especially pronounced by smaller companies that lack the financial and technical resources to navigate them. While these challenges may present some barriers, the advantages of RegTech including scalability and further accuracy and costs reduction- do render this an attractive option for SMEs.

The results also highlight the need for more awareness and education on RegTech, particularly for SMEs who did not use these technologies but potential high economic benefits could have been achieved through their adoption. Thus, this research extends empirical examinations of the impact of RegTech into a sector that has received little attention in extant literature and contributes to emerging work on RegTech.

Future Work

Based on the findings from this research there are several encouraging areas for follow-up work. Future studies may focus on longitudinal research to study the long-term effects of RegTech adoption in SMEs, effectively lodge a more comprehensive understanding how RegTech contributes to reducing regulatory costs and enhancing operational efficiency over time. Second, increasing the geographic spread of research to include SMEs in different parts of world would provide a more global perspective from which one can investigate adoption and usage RegTech effectively considering governments with varied regulatory geographies or market conditions.

Similarly sector-based analyses would investigate in depth the key issues and opportunities connected with adopting RegTech solutions across diverse industries ensuring that such solutions are fit for purpose, simplifying specific regulatory requirements. It is also important to research the integration of new technologies as artificial intelligence (AI), machine learning (ML) and blockchain in a RegTech context that can make another leap forward over its capacities with current problems faced by SMEs.

Standardisation of regulatory requirements across geographies would also foster the uptake of RegTech at scale, especially for SMEs which tend to operate in more than one region. Further research may examine the wider economic implications of RegTech inclusion, and its contribution to SME competitiveness, growth and innovation. An appreciation of these macroeconomic consequences may also facilitate policy-makers in creating factors to guide RegTech assimilation. This, however highlights the need for further research to delve into both behavioural and cultural inhibitors in adopting RegTech by SMEs provide an avenue towards developing better strategies aimed at promoting these technologies within this sector.

In sum, RegTech offers immense promise for SMEs but one that come with a range of financial and technological start-up costs as well as operational challenges to be met. Future research in these areas can help develop RegTech solutions that are more effective, accessible and scalable meeting the wide-ranging needs of SMEs across different sectors and geographies thereby enabling them to negotiate an increasingly complex regulatory environment with greater ease.

References

Abdul-Jabbar, H., 2009. Income tax non-compliance of small and medium enterprises in Malaysia: Determinants and tax compliance costs (Doctoral dissertation, Curtin University).

Admati, A. and Hellwig, M., 2014. *The bankers' new clothes: What's wrong with banking and what to do about it*. Princeton University Press.

Anagnostopoulos, I., 2018. Fintech and RegTech: Impact on regulators and banks. Journal of Economics and Business, 100, pp.7-25.

Arifin, S.R.M., 2018. Ethical considerations in qualitative study. International journal of care scholars, 1(2), pp.30-33.

Arner, D.W., Barberis, J. and Buckley, R.P., 2015. The evolution of Fintech: A new post-crisis paradigm. Geo. J. Int'l L., 47, p.1271.

Arner, D.W., Barberis, J.N. and Buckley, R.P., 2016. The emergence of RegTech 2.0: From know your customer to know your data.

Bagby, J.W. and Packin, N.G., 2020. RegTech and Predictive Lawmaking: Closing the RegLag Between Prospective Regulated Activity and Regulation. Mich. Bus. & Entrepreneurial L. Rev., 10, p.127.

Bamberger, M., Rao, V. and Woolcock, M., 2010. Using mixed methods in monitoring and evaluation: experiences from international development. World Bank Policy Research Working Paper, (5245).

Baxter, M., 2018. Product design. CRC press.

Broby, D., 2021. Financial technology and the future of banking. Financial Innovation, 7(1), p.47.

Calderon, T., & Aparna, P. (2020). *Regulatory compliance in the AI regime: Banks and Fintech*.

Compliance Costs and Consequences. International Journal of Retail & Distribution Management, 35(4),

compliance.

Compliance.ai. (2020). Regulatory change management process improvement and savings analysis: A case study in the financial services industry.

Creswell, J.W., 2011. Controversies in mixed methods research. The SAGE.

Dabaghia, M.N., Alhorani, A., Al-Qaruty, T.M.R., Darwazeh, R.N. and Areiqat, A.Y., 2024. Revolutionizing Finance: How FinTech, RegTech, and AI are Redefining the Financial Landscape. Kurdish Studies, 12(2), pp.540-546.

De Oliveira, P.H. and Terence, A.C.F., 2018. Innovation practices in small technology-based companies during incubation and post-incubation periods. Innovation & Management Review, 15(2), pp.174-188.

Deloitte Insights. (n.d.). Reducing regulatory compliance costs with RegTech. Deloitte.

Di Castri, S. and Plaitakis, A., 2018. Going beyond regulatory sandboxes to enable FinTech innovation in emerging markets. Available at SSRN 3059309.

Dubey, V., Sonar, R., & Mohanty, A. (2020). FinTech, RegTech and contactless payments through the lens of COVID-19 times. *International Journal of Advanced Science and Technology, 29*(6), 3727-3734. (27632-ArticleText-42760…).

Fenwick, T. and Edwards, R., 2016. Exploring the impact of digital technologies on professional responsibilities and education. European Educational Research Journal, 15(1), pp.117-131.

Financial Stability Oversight Council Releases 2023 Annual Report https://home.treasury.gov/news/press-releases/jy1991

Finlay, S., & Brooker, M. (2020). *Artificial intelligence in RegTech: Predicting financial market trends*. *Journal of Financial Regulation and Compliance, 28*(3), 450-465.

Finlay, S., & Brooker, M. (2020). Artificial intelligence in RegTech: Predicting financial market trends. Journal of Financial Regulation and Compliance, 28(3), 450-465.

Grant Thornton LLP. (2019). Is RegTech the future of compliance? Grant Thornton LLP. https://www.grantthornton.com

Jadhav, J. L. (2023). An empirical study on regulatory technology (RegTech). *SSRN*

Johnson, P. (2017). *Digital transformation and the rise of RegTech in financial services*. *Journal of Financial Compliance, 5*(1), 21-32.
Johnson, P. (2017). Digital transformation and the rise of RegTech in financial services. Journal of Financial Compliance, 5(1), 21-32.
Kavassalis, P., Stieber, H., Breymann, W., Saxton, K. and Gross, F.J., 2018. An innovative RegTech approach to financial risk monitoring and supervisory reporting. The Journal of Risk Finance, 19(1), pp.39-55.
Laforet, S. (2013). Organizational innovation outcomes in SMEs: Effects of age, size, and sector. Journal of World Business, 48(4), 490-502.
Madhusudan, B., & Balachandra, S. (n.d.). *RegTech: The necessary innovation in the regulatory compliance space*. ALTEN Calsoft Labs. Retrieved from http://www.altencalsoftlabs.com
Micro, Small and Medium Enterprises Development Act, 2006. (2006). Government of India. https://www.msme.gov.in/circulars/msme-development-act-2006-rules-26-september-2006
Moshirian, F., 2011. Global financial crisis, international financial architecture and regulation. Journal of Banking & Finance, 35(3), pp.499-501.
Nguyen, T.P.T., Nghiem, S.H., Roca, E. and Sharma, P., 2016. Efficiency, innovation and competition: Evidence from Vietnam, China and India. Empirical Economics, 51(3), pp.1235-1259.
OCC. (2018). Semiannual Risk Perspective. Office of the Comptroller of the Currency. https://www.occ.gov/publications/publications-by-type/semiannual-risk-perspective/pub-semiannual-risk-perspective-spring-2018.pdf
Oliveira, P., & Terence, C. (2018). *Regulatory compliance in the age of artificial intelligence: Challenges and opportunities*.
Pennachin, C. ed., 2007. Artificial general intelligence (Vol. 2, p. 1). New York: Springer.
Ponmani, R. (2011). Innovation in small and medium enterprises (SMEs): The impact of organizational culture and leadership. International Journal of Innovation Management, 15(5), 943-958.
Santos, J., & Mendes, R. (2019). Understanding the rise of regulatory technology and challenges in the financial sector. Journal of Namibian Studies: History Politics Culture, 23(1), 32-45.
Santos, J., & Mendes, R. (2019). *Understanding the rise of regulatory technology and challenges in the financial sector*. *Journal of Namibian Studies: History Politics Culture, 23*(1), 32-45.
Schmidt, R. Ä., Bennison, D., Bainbridge, S., & Hallsworth, A. (2007). Legislation and SME Retailers:
Sharma, M., Singh, R., Vaish, K., Chythanya, K. R., Kathuria, S., & Awasthi, S. (2023). Artificial intelligence in RegTech to predict financial market trends. *2023 6th International Conference on Contemporary Computing and Informatics (IC3I)*, 925-930.
Sharma, M., Singh, R., Vaish, K., Chythanya, K. R., Kathuria, S., & Awasthi, S. (2023). Artificial intelligence in RegTech to predict financial market trends. 2023 6th International Conference on Contemporary Computing and Informatics (IC3I), 925-930.
Smith, J. (2018). The impact of unnecessary compliance: Ease of doing digital business in India. Digital Business Quarterly, 4(2), 56-73.
Smith, J. (2018). The impact of unnecessary compliance: Ease of doing digital business in India. Digital Business Quarterly, 4(2), 56-73.
Technology in Society, 72, p.102150.
Teichmann, F., Boticiu, S. and Sergi, B.S., 2023. RegTech–Potential benefits and challenges for businesses.
Thomson Reuters Regulatory Intelligence. (2023). *2023 Cost of Compliance: Regulatory burden poses operational challenges for compliance*.
Von Solms, J. (2021). Integrating regulatory technology (RegTech) into the digital transformation of a bank treasury. *Journal of Banking Regulation, 22*(2), 152-168.
White, G., & Harris, L. (2019). The imperative to automate regulatory change management for compliance in financial services.
Wilson, D.T., 1995. An integrated model of buyer-seller relationships. Journal of the academy of marketing science, 23(4), pp.335-345.
Zalan, T. and Toufaily, E., 2017. The promise of fintech in emerging markets: Not as disruptive. Contemporary Economics, 11(4), p.415.