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# Positive and Negative Impacts of COVID-19 in Digital Transformation

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**Abstract:** This study was designed to research the impact of pandemic situations such as COVID-19 in digital transformation (DT). Our proposed study was designed to research whether COVID-19 is a driver of digital transformation and to look at the three most positive and negative DT disruptors. Our study suggests that COVID-19 is a driver of digital transformation, since 94 percent of respondents agreed that COVID-19 is a driver of DT. The second phase of our study shows that technology, automation, and collaboration (TAC) is the most positive significant factor which enables work from anywhere (WFA) (or work from home) arrangements and also leads to the third positive factor of a work-life balance (WLB). The top three negative factors are no work-life balance (NWL), social employment issues (SEI), and data security and technology issues (DST). The negative factors show a contradictory result since NWL is the most negative factor, even though WLB is the third most positive factor. While the pandemic situation is leading to a positive situation for economies and organizations at a micro level, the negative impacts, which will affect overall economic growth as well as social, health, and wealth wellbeing, need to be kept in mind. The motivation of this study was to research positive and negative effects of COVID-19 on DT, since COVID-19 is impacting everyone and everyday life, including businesses. Our study developed a unique framework to address both positive and negative adoption. Our study also highlights the need for organizations and the economy to establish mitigation plans, as the pandemic has already been disrupting the entire world for the past three quarters.

**Keywords:** pandemic; COVID-19; digital transformation; work-life balance; work from anywhere

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## 1. Introduction

The year 2020 was a pandemic year for the whole world, since COVID-19 affected everyone's lives during that year. COVID-19 is a disease involving a coronavirus ("CO" stands for corona, "VI" for a virus and "D" for disease) [1]. COVID-19 has had adverse impacts for almost three quarters since the World Health Organization's (WHO, Geneva, Switzerland) announcement regarding the disease on 30 January 2020. The COVID-19 virus is a severe acute respiratory syndrome related virus [1,2]. Entire economies are trying to overcome the pandemic it has caused because it is a life-threatening issue for every

nation. As mentioned by the WHO, COVID-19 is one of the most serious global pandemics, akin to the Spanish flu [3]. Under the prevailing circumstances, there is no solution available to end or control this pandemic and the only solution is to follow the WHO guidelines as much as possible [3]. Notably, there are vaccines such as the Pfizer and Moderna vaccines which show efficient and promising results, as was mentioned by the WHO. Moreover, Canada and many other countries have started vaccinating their senior citizens, and they are expanding their vaccine roll outs to cover their entire populations, based on the latest news on the topic (15 December 2020). As per the prevailing circumstances, there are 50 vaccines that are currently in trials and the WHO is working with scientists and health organizations worldwide [3].

Digital transformation (DT) has been defined in many ways, but generally it is the use of information and communication technologies (ICT) along with their benefits [4] to change business operating models, products, services, and organizational structures to obtain a competitive advantage. According to Vial [5], "DT is a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies". There are other definitions of DT [6] such as an "opportunity to create a new business model". The expectations and benefits involving DT are somewhat broader [7], since it is expected to trigger changes in customer experiences, customer serendipity, business growth, increases in customer touchpoints, changes to operating models, and so on.

DT is quite disruptive, as it changes the way that businesses operate and deliver goods and services to the customer. DT has played a major role in daily business operations during the last three-quarters when the COVID-19 pandemic was in effect. Hence, it is crucial to study the correlation between COVID-19 and DT. Given the negative impacts of COVID-19 on DT, whether we like it or not, survival is essential and even if businesses cannot operate normally, we have to return the business sector back to normalcy where possible [8]. Businesses are not operating as expected, as they are constantly being affected by the state of this pandemic. The ways that businesses are constantly being affected is pushing us towards a broader global recession, and hence there is a great need [8] to take some effective steps now for the economic well-being of mankind. Tax reform and collection processes are being delayed [7], as the "digital link" deadline for making tax digital (MTD) is no longer a high priority. COVID-19 is initiating indirect tax and digitalization on tax functions temporarily [7]. Due to COVID-19, tax reformation, collection processes, underlying IT systems, and tax policies are being changed temporarily [9,10] at the macro level, which is a burden to citizens and at the same time is difficult to use to maintain the sustainability of the economy. In addition to tax reform for individuals, there are concerns involving tax reform [11] for the top billionaires or large players such as Google, Amazon, Facebook, and Apple (GAFA). Even though the world risks being affected by a broad economic and democratic recession due to the pandemic, tax obligations on GAFA have not been affected and their contribution is currently just 0.2 percent of their wealth [11].

The economic and social wellbeing of mankind is greatly affected by the COVID-19 pandemic in part because the insurance market is also being affected by COVID-19 [12], which is a serious concern for social security at the macro level. Because customers are constantly being locked down and, therefore, are strongly affected by the pandemic, a change in digital business models and related technology components is needed to do business while the pandemic persists. In other words, contactless payments can be very much expected to increase under current digital business models [13]. Another emerging situation in the field of education is to figure out the best way to resume schools, at least online, which requires online learning platforms, changes in the learning process, and the provision of e-contents [14]. Furthermore, the current role of teachers and students are also to be changed. Because schooling is one of the basic needs for the next generation, COVID is beginning a change in the school operating model. Keeping these technological changes in the teaching methods, the related political issues should be resolved as soon as possible. Unlike a local disease, as this epidemic is widespread, the expectation at the

macro level is a world of intercultural relationship and unity [15]. As the economy is fully affected, there is an identified unfair and deceptive trade service [16]. The business sector has identified internal risks and changes in external market conditions [17] to be mitigated as well. In addition to the economic [8] issue, social threats and changing communication practices (telecommunication) are retarded [18] by the COVID-19 situation. Since the proliferation of technology, information usage and security risks are high. The business and data are subject to phishing and loss of information [19]. Data centralization is very much expected [20] as the information is needed everywhere and anywhere to be accessible to employers and employees. Another economic issue of reduction in trade interconnection [1] is also identified as the impact of COVID-19.

As COVID-19 is something serious and affects every citizen in the entire world, DT is somewhat of a buzzword that most of the business and community sectors are talking about. As reviewed in the literatures cited in the above section, COVID-19 is leading to both negative and positive impacts in the DT journey. However, it is unclear whether the positive impact is on social and economic wellbeing, and at the same time the extent of negative impact is unclear. As COVID-19 is impacting everyone and everyday life, including businesses, DT is one of the key players which drive virtual business and social community. COVID-19 has many effects in both positive and negative senses. This topic of study is still quite new at this time, so it is quite important to research this topic to contribute further to how the COVID-19 pandemic can be translated into positive aspects. At the same time, it's important to investigate the social wellbeing and business factors which are negatively impacted so that they can be mitigated when this paper is utilized properly. The authors of this papers are motivated to address these following questions.

- Is COVID-19 a driver of digital transformation?
- What are the top three positive factors that COVID-19 is attributing to digital transformation?
- What are the top three negative factors that COVID-19 is attributing to digital transformation?

To address our questions, a new adoption framework with homogenous factors is needed. Our study will develop a model framework to identify and analyze the variables responsible for the positive and negative effects of COVID-19 in DT. The domain identification and instrument development for the framework are proposed in the following sections. This is then followed by data collection, analysis, testing of hypothesis, results, discussions and implications, and conclusions in subsequent sections.

## 2. Literature Background

### *2.1. The Negative and Positive Impact on DT Due to COVID-19*

The following are the consolidated negative impacts on DT which are due to the COVID-19 pandemic (Table 1).

**Table 1.** Negative impacts on digital transformation (DT) due to COVID-19.

| Item # | Negative Impact on DT | References |
|---|---|---|
| 1 | Reformation of the tax system and other IT components in tax specific services<br>Digitalization in the tax function | [7,11] |
| 2 | Delay in digital link deadline for making tax digital (MTD) | [21] |
| 3 | The expectation of the digital learning platform and digital ecosystem<br>Expected innovation in the way business is conducted through information and communication technologies (ICT) usage<br>Lack of digital literacy<br>Tweaking IT systems of additional catastrophic requirement | [8,22] |
| 4 | Better communication channels<br>Expected new IT skill and platform for crisis management<br>Expected contactless payment system | [10] |
| 5 | Expected digital business model<br>Contract tracing as a digital nurse | [13,22] |
| 6 | Expected online learning platform and online e-contents<br>The emergence of data and insight | [14] |
| 8 | Virtual technologies<br>Telecom practice | [17,18] |
| 9 | Mitigating risk such as phishing attacks | [19] |
| 10 | Expected telecare/telemedical service | [10,23–25] |

Looking at the positive impacts of COVID-19 in driving DT, there is a pressure to enable a digital ecosystem, digital learning, and agile business models [8] for business survival and sustainability. As identified by Sathya Nadella of Microsoft [26], keeping the future in mind, the skill of DT is growing extremely fast. This is indicated by the emergence of new opportunities in businesses [27–29] such as 5G, proliferated use of AI and ML, filling gaps in B2B2C and B2B, and retarding cultural change by collaboration and strong expectation or potential for quality management. There are a lot of other IT-related business opportunities [30,31] in the space of IoT such as predictive analytics, cloud computing, healthcare, mobility, social media and collaboration, use of automation platform, robotics, medical imaging [32–34], wearables, and so on. Furthermore, trade interconnection, telepresence, telecare, and telecommunication have other positive effects on growth [1].

The management of disaster, pandemic, and emergencies are leading to tweaking the IT system [9] which is a positive impact on driving DT. Digital learning and digital ecosystems were part of the competitive factor, whereas they are now the basic requirement for most of the economies since education and schooling are very much impacted [8,35]. The following in Table 2 are some of the positive impacts to drive DT but are not limited to these.

**Table 2.** Positive impact to drive DT.

| Item # | The Positive Impact to Drive DT | References |
|---|---|---|
| 1 | The emergence of the digital ecosystem<br>Digital learning platform<br>Digital handshake between student and teacher | [8,14] |
| 2 | New business opportunity to tweak the IT system<br>New pandemic management system<br>The emergence of telecare service | [7,9,36] |
| 4 | Ecommerce and contactless payment system | [13] |
| 5 | Digitalization of tax function | [7] |
| 6 | Virtual technologies, technology-based development, AI, and ML<br>Proximity deduction using Bluetooth devices | [17,22,27–29] |
| 7 | System of collaboration management<br>System to manage emergencies, pandemic, safe distancing monitor<br>Hazard detection | [37–39] |
| 8 | Centralized data management and big data system | [20] |
| 9 | Network, cloud, social media, IoT, and wearables | [31,38] |

### *2.2. Frameworks for Technology Adoption*

The TOE model [40] was looking at the technological, organizational, and environmental context to identify the influencing factor on innovation and adoption, whereas innovation diffusion theory (IDT) [41] was focusing on economic, social, and communication contexts within the organization. Similarly, the MOA model [12] has been widely applied in the management disciplines, whereas motivation refers to a willingness to act; opportunity refers to the environmental or contextual mechanisms that enable motivation and the ability refers to the individual's skills. RBV theory [42] is one of the classical theories in the information systems based on Edith Penrose's (1959) theory of firm growth. Moreover, RBV focuses on the resources in the form of products, people, and processes. Moreover, the technology-acceptance-model (TAM) [43] focuses on the acceptance and adaptability of technology by an individual in the organization, whereas the unified-theory of acceptance and use-of-technology (UTAUT) focuses on the user intentions towards information systems [44]. Each of these models has unique factors or constructs as it is meant for such specific usage in technology acceptance, diffusion, and usage. Our study is looking at this model differently by allowing respondent to free flow positive or negative attributes and perform meta-analysis to look at the appropriate factor/parameters for further hypothesis. The outcome of this approach will be leading to factor identification and modeling definition for this study. The resultant model and hypothesis will help to test the research questions with the respective hypothesis.

## 3. Methods

As the purpose of this study is to address the questions discussed in the above section, it is important to identify and develop a model to identify the hypothesis for further analysis. This study uses Churchill's approach [45] by categorizing variables, identifying factors, and constructing a model for further testing and analysis. Refer to Figure 1 for the proposed approach in the process of developing the model, creating hypotheses, data collection, validation, data analysis, hypothesis testing, results, and discussion.

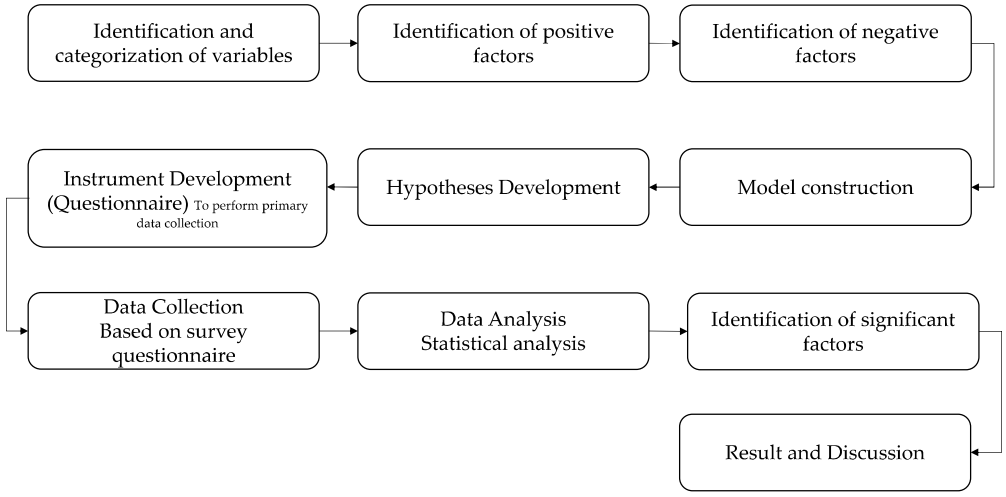



**Figure 1.** A proposed approach to model development and testing.

### *3.1. Instrument Development*

This is the process of developing questionnaires to conduct a survey and collect appropriate data. Due to data privacy, the author decided to collect email address and years of experience (0 to 10 years and greater than 10 years) to understand the profile of respondents. The next question is to get a response on whether COVID-19 is a driver of DT. This question is a checkbox of yes or no. "Yes" will direct respondents to the next section for asking more questions on positive and negative impact. "No" directs the respondent to stop here and submit an answer. The next section is for collecting responses on three positive changes and three negative changes in DT. These six questions are of free text to allow the respondent to provide the answer as the study does not want to predefine to something which may not be appropriate. Refer to Table A1 for the questionnaires in Appendix A as defined here.

### *3.2. Identification of Factors*

As per the instrument developed in the above section, the six questions (each three for positive and negative impact) are of free text answer. Our study will perform meta-analysis [46] to identify appropriate contexts and group the responses together to come up with the final factors for model development. The meta-analysis and factor identification will be performed after the data collection.

### *3.3. Model Development*

After the final output of factors in the identification stage, those factors will be used to develop the model. The proposed model is stated in Figures 2 and 3. Figure 2 is to show whether COVID-19 is a driver of DT with a single question with the expected mandatory answer of yes or no, whereas Figure 3 is to show the hypotheses for other questions relating to the top three positive and negative impacts of DT due to COVID-19.

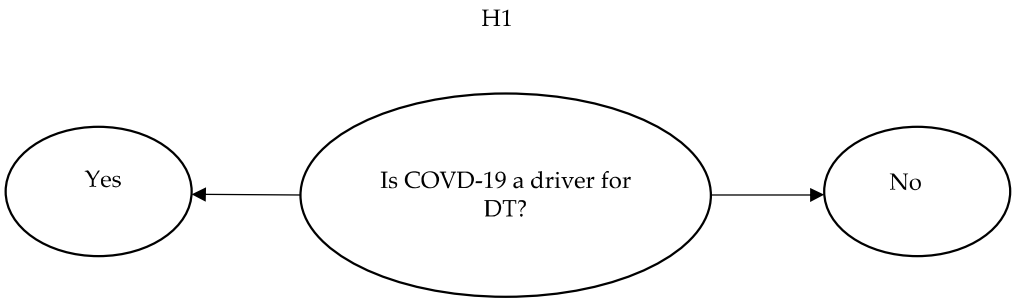



**Figure 2.** Is COVID-19 a Driver of DT?

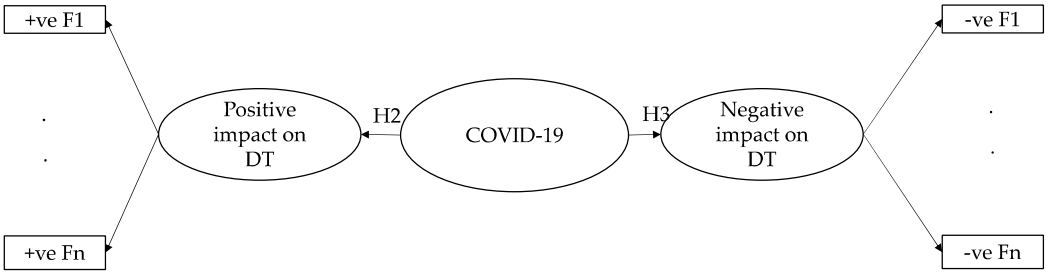



**Figure 3.** A proposed model. (Note: actual factor name will be identified at the data cleansing and factor identification stage).

### *3.4. Hypotheses Development*

As stated in the literature review section, COVID-19 is quite disruptive, inhibiting the whole world and affecting human wellbeing [8]. Almost everyone is working from home because COVID-19 has affected three quarters so far and it seems almost impossible to control. The DT in the form of change in IT systems and applications is regarded as transactions in day-to-day life are getting changed by working from home, home-based learning systems, and so on. This hypothesis "H1: Is COVID-19 a Driver for Digital Transformation?" is to check whether COVID-19 is a driver for DT. As this is a direct question through the survey questionnaires, data validation will be just descriptive. The model in Figure 2 provides a direct answer to this question.

The hypothesis "H2: What Are the Top Three Positive Factors That COVID-19 Is Attributing to Digital Transformation?" is the extension of our testing when the respondent responded to question 1 "COVID-19 as a driver for DT" as yes. Questions 2 to 4 are collecting the positive impact of DT. The factors will be identified based on meta-analysis as mentioned in "identification of factor" as explained above. Then the data analysis will help to figure out the top three positive factors that attribute to DT.

The hypothesis "H3: What Are the Top Three Negative Factors That COVID-19 Is Attributing to Digital Transformation?" is the extension of our testing to identify top three negative factors. Questions 5 to 7 are collecting responses to the negative impact of DT. The factors will be identified based on meta-analysis as mentioned in "identification of factor" as explained above. Then the data analysis will help us to figure out the top three negative factors that attribute to DT.

### *3.5. Data Collection*

The respondents were chosen using purposive sampling. The study is performed with employees in an enterprise environment with different levels of experience. There is a wide distribution of experience levels since the categories (less than 10 years and more than 10 years) were used in our instrument. This survey was sent to 135 recipients and

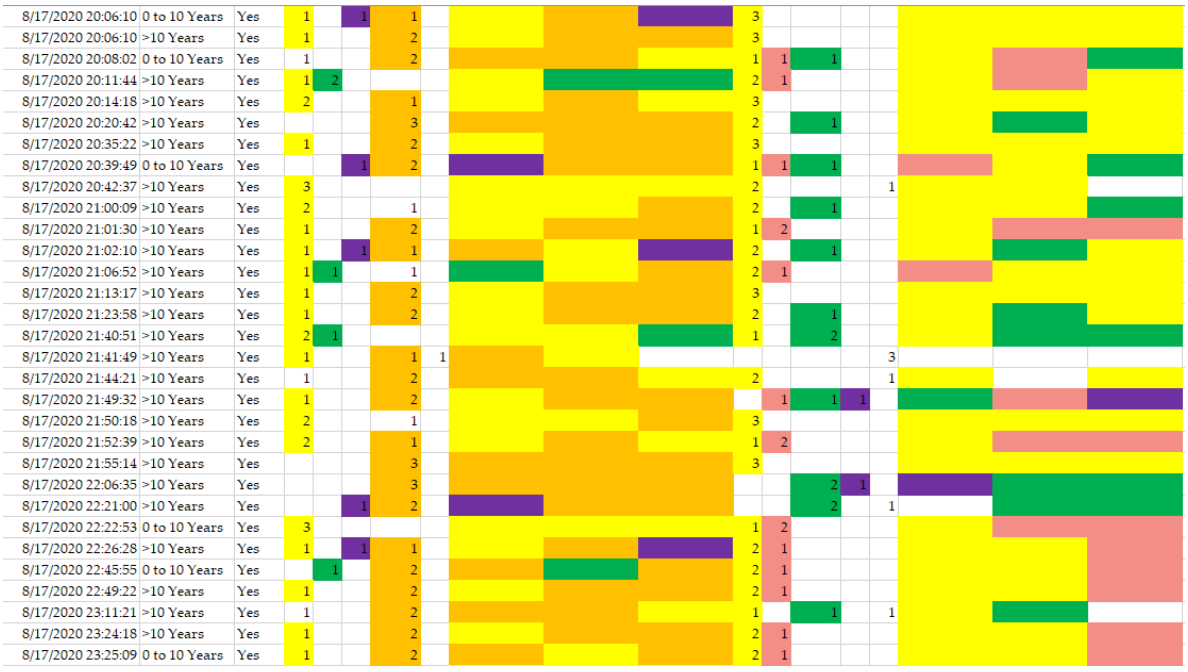
received acceptable unique responses of 87 percent for this empirical analysis [47]. Looking at their employment profiles, 79 percent of them had greater than 10 years of experience and 21 percent of them had less than 10 years of experience (Table 3). Respondents reported that it took them less than 2 min to complete the survey.

**Table 3.** Respondent's employment profile.

| Year of Experience in Employment | Number of Respondents |
|---|---|
| Greater than 10 Years | 91 |
| Between 0 and 10 years | 94 |

Data Cleansing and Factor Identification

The data are collected to allow the respondent to answer in free text for three positive and three negative changes of DT due to COVID-19. The meta-analysis was to group these responses to form the construct for further analysis. The responses are codified (Figure 4) as part of the meta-analysis. The data in Table 4 are the categorization and grouping of various responses from the outcome of meta-analysis. There are very few answers which fall outside of DT related factors and are eliminated as false positives in the data analysis.



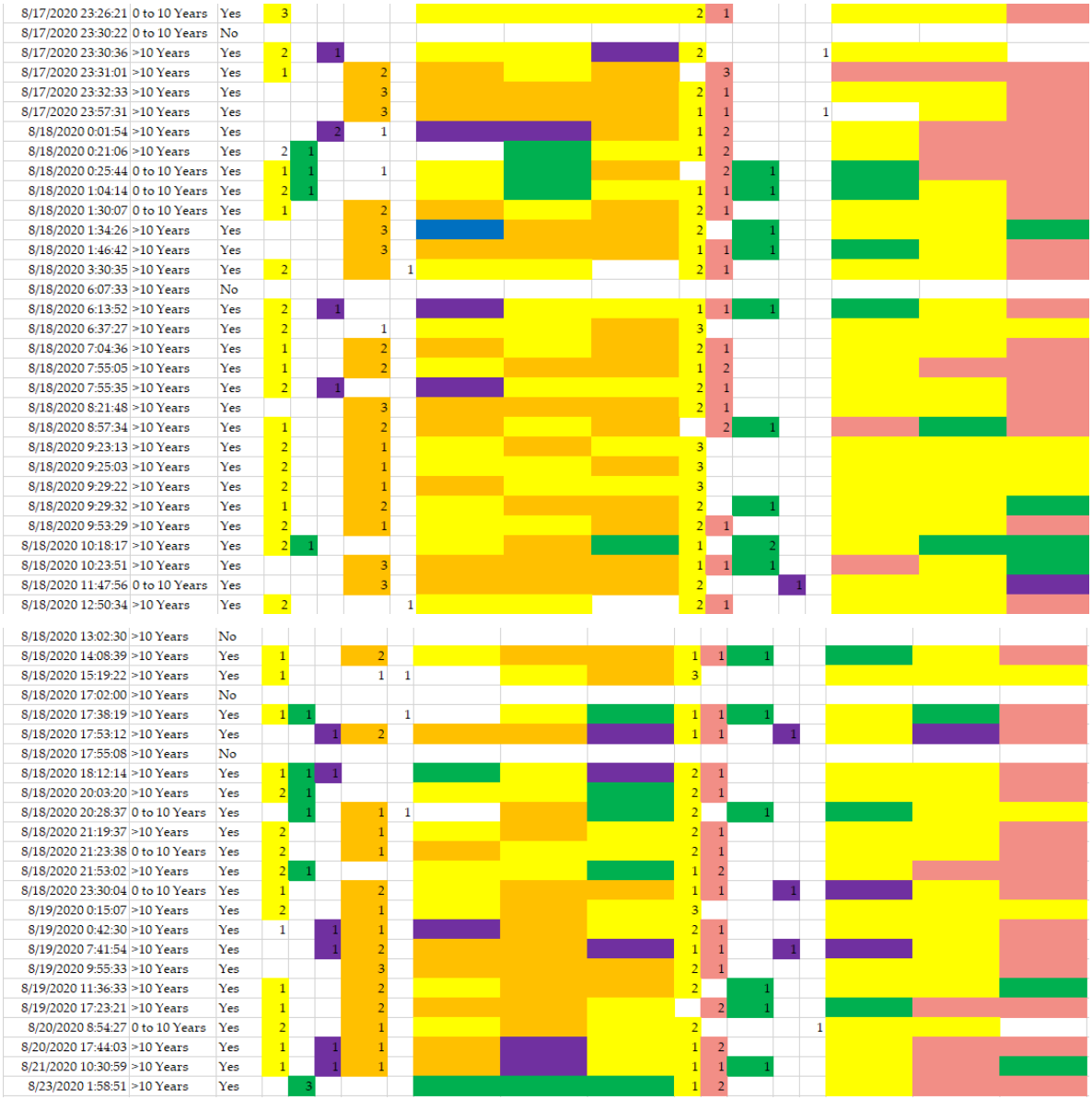



**Figure 4.** Raw responses. (Note: converted raw response is presented as pictured).

**Table 4.** Independent variables (IVs) and factor identification.

| Item # | Positive and Negative Variables to Drive DT | Various Responses |
|---|---|---|
| | Positive factor/Construct | |
| 1 | IV: Work from anywhere (WFA) | Work from home (WFH)<br>Lessor no travel to the office<br>WFA<br>More productivity<br>Remote working<br>Flexibility in work<br>Pollution-free<br>Time-saving as no commuting needed<br>Spend long working hours<br>Do multitask<br>No global barrier |
| 2 | IV: Work-life balance (WLB) | Work-life balance<br>Flexible work arrangement<br>Spend time with family or children<br>Review work culture<br>Balanced lifestyle<br>Stay together<br>Connect with friends |
| 3 | IV: Innovative business model (IBM) | Business model innovation<br>An alternate channel of work<br>Evolution of product, service and processes<br>Run business remotely<br>Change in customer engagement<br>Essential service<br>Service personalization<br>Driving innovation<br>Innovative solution |
| 4 | IV: Technologies, automation, and collaboration (TAC) | Business goes digital<br>Customer ready to explore new technologies<br>Importance of automation<br>Cloud technology adoption<br>Online transaction improvement<br>Online business<br>Digitalization<br>Online learning<br>Video, conference, virtual meeting, Tele conversation<br>Telecommuting<br>IT security<br>Virtual workplace<br>Mobility<br>Globalized skill sharing<br>Business process improvement<br>The wise use of scrum |
| | Negative factor/Construct | |
| 5 | IV: No work-life balance (NWL) | No work-life balance<br>No-defined working hours/long hours<br>Health<br>Lack of physical/social interaction<br>Too many distractions<br>Overwork<br>Back-to-back virtual meeting/unscheduled |
| 6 | IV: Social and employment issue (SEI) | Less confidence<br>Unemployment<br>Loss of Job<br>Job insecurity<br>Stress<br>Low income<br>More home expenses<br>Divide of rich and poor |

| | | |
|---|---|---|
| 7 | IV: Data, security, technology issues (DST) | Buying unwanted things<br>No social life<br>Security vulnerability/breach<br>Technology reliant<br>Slowness/network issue<br>Data privacy/cybersecurity<br>Additional technology skillset<br>Misuse of technology by family members<br>Lack of technology infra robustness<br>Cybercrime/online fraud<br>Technology complexity |
| 8 | IV: Business model change (BMC) | Bricks and mortar business suffer<br>Economic volatility<br>The long-run business sustainability question<br>Human touch is not possible by technology<br>Manpower reduction<br>Sales decline |

Refer to the Figure 5 for the model as defined as the outcome of the factor identification.

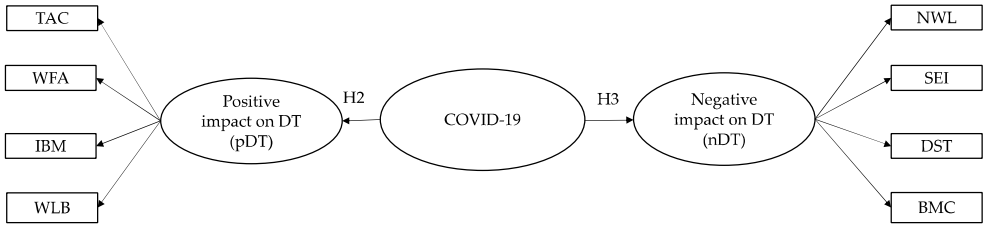



**Figure 5.** Proposed conceptual model.

*3.6. Data Analysis*

The data were converted to CSV file for the analysis using R application (an open-source statistical and data science scripting platform). The version of R is 3.6 which is the latest version at the time of this analysis. The author has validated sample size using semTools (formula as below) and found that the sample size required is 97 as compared to actual sample of 117 (appropriate for SEM analysis in R).

*findRMSEAsamplesize(rmsea0 = 0.05, rmseaA = 0.08, df = 100, power = 0.80)*

The libraries of Lavaan 0.6–7 [48], sem, semPlot, and Lavaan were loaded for the analysis. The reliability and consistency were tested, and the overall Cronbach's alpha is ~0.60 (acceptable) since the number of questions is less than 10 [45]. The data analysis was performed using structural equation modeling (Lavaan-SEM). This method is widely used in the IT and information system field of research to evaluate the suitable prediction between the proposed constructs and the dependent variables [49]. The model fit analysis was evaluated based on the Lavaan-SEM analysis. It ended normally after 132 iterations, and it showed convergence properly as shown in Table 5.

**Table 5.** Model fit analysis/proper convergence.

| **SEM Output** | |
|---|---|
| Ended normally after 132 iterations | 132 iterations |
| Default estimator | Maximum likelihood |
| Optimization method | NLMINB |
| Free parameters | 19 |
| Observations | 117 |
| Model Test User Model: | |
| Test statistic | 27.309 |
| DF | 17 |
| Chi Square *p*-value | 0.054 |
| Model Test Baseline Model: | |
| Test statistic | 314.904 |
| DF | 28 |
| *p*-value | 0.000 |
| User Model versus Baseline Model: | |
| Comparative Fit Index | 0.964 |
| Tucker-Lewis Index | 0.941 |
| Loglikelihood and Information Criteria: | |
| Loglikelihood user model (H0) | 729.494 |
| Loglikelihood unrestricted model (H1) | 715.839 |
| Akaike | 1496.988 |
| Bayesian | 1549.469 |
| Sample-size adjusted Bayesian | 1489.408 |
| Root Mean Square Error of Approximation: | |
| Root Mean Square Error | 0.072 |
| 90 Percent confidence interval—lower | 0.000 |
| 90 Percent confidence interval—upper | 0.120 |
| *p*-value RMSEA ≤ 0.05 | 0.217 |
| Standardized Root Mean Square Residual: | |
| Standard Root Mean Square | 0.099 |

The overall summary information of goodness-of-fit-analysis shows very positive results, since GFI = 0.95, AGFI = 0.90, TLI = 0.94, CFI = 0.9, RMSEA = 0.07, and SRMR = 0.10. Refer to Table 6 for details of the references. Refer to the following Figure 6 for the value of significance as analyzed in this study.

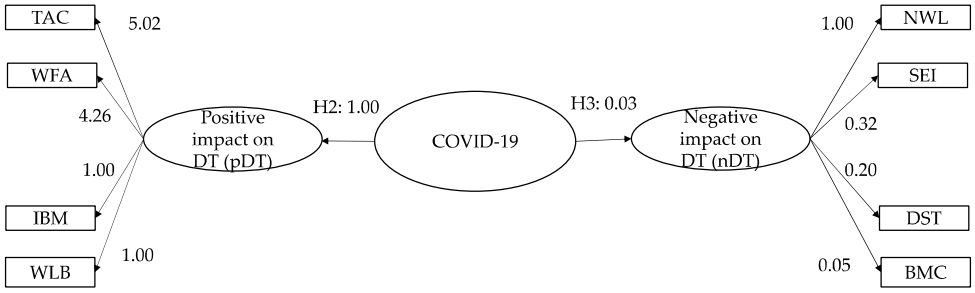



**Figure 6.** Significance diagram.

**Table 6.** Good-to-fit analysis.

| Measure | Norms (for a Good Fit) | Analysis Output | Reference |
|---|---|---|---|
| $x^2$ | $p$-value > 0.05 | 0.054 | Hooper. 2018 and [36] |
| GFI/AGFI | GFI ≥ 0.99<br>AGFI > 0.90 | GFI = 0.95<br>AGFI = 0.90 | Hooper. 2018 Tetteh. 2015, and Kline. 2010 |
| TLI | TLI ≥ 0.95 | 0.94 | Tetteh. 2015, and [36] |
| CFI | CFI ≥ 0.90 | 0.96 | Tetteh. 2015, [50], and [36] |
| RMSEA | RMSEA < 0.08 | 0.07 | Hooper. 2018, Tetteh. 2015, and [36] |
| SRMR | SRMR < 0.08<br>*** 0 to 0.1 deemed acceptable (Hooper. 2018) | 0.1 | Tetteh. 2015, Hooper. 2018, and [36] |

*** Note: According to Hooper (2018) the acceptable SRMR value is 0 to 0.10.

### *3.7. Testing the Hypothesis*

#### 3.7.1. Hypotheses H1: Is COVID-19 a Driver of DT?

We will start by looking at the data analysis for hypothesis (H1), which is a simple descriptive statistic with an expected answer of yes or no. The descriptive statistic shows that this hypothesis is true as the answer is yes for 94 percent and no for 6 percent only. As such, 94 percent of the respondent responded that COVID-19 is a driver of DT in a pandemic situation. The driver of DT can be positive or negative, which is further tested in H2 and H3. As the DT is quite disruptive [4] in the changes to business and operating models, COVID-19 is one of the enablers of DT as tested in this hypothesis. COVID-19 is the enabler of the DT journey at the macro level since the data collection in our study is at the macro level.

#### 3.7.2. H2: What Are the Top Three Positive Factors that COVID-19 Is Attributing to Digital Transformation?

The top three positive factors are technology, automation, and collaboration (TAC); work from anywhere (WFA); and work-life balance (WLB). The study also shows that innovative business model (IBM) is also at the same level of prediction as WLB. WLB was baselined to 1.0 and TAC is 5.02, which is far more significant than WLB. Moreover, WFA is 4.26 is far more significant than WLB. IBM is more or less at the same level of significance as WLB. However, descriptive statistics of WLB is 21 as compared to IBM 18. Hence the top three positive factors are TAC, WFA, and WLB. Refer to the discussion section for further discussion and literature.

#### 3.7.3. H3: What Are the Top Three Negative Factors that COVID-19 Is Attributing to Digital Transformation?

The top three significant factors which are negatively attributed to DT are no work-life balance (NWL); social and employment issues (SEI); and data, security, and technology issues (DST). When NWL is baselined to 1.00, SEI is 0.32 and DST is 0.20. Refer to the discussion section for further discussion and literature.

## 4. Results

The first hypothesis is all about whether COVID-19 a driver for DT. Based on the direct answers from the respondent, there are 110 responses of "yes" (COVID-19 is a driver of DT) and 7 responses of "no" (not a driver for DT). This study was conducted globally during this peak period of COVID-19 (within last 12 months) and received a response rate of 87 percent since the subject of this study was of interest to most of the respondents. The result for H1 is just a descriptive analysis which shows that COVID-19 is a driver of DT. The responses for the subsequent questions are only when the answer to hypothesis one (H1) was "yes".

H2 was to check the top three positive factors that COVID-19 is attributing to digital transformation. The analysis shows that the top three positive significant factors are (as in Figure 6) TAC (technologies, automation, and collaboration), WFA, and WLB. Additionally, looking at the descriptive data, responses are TAC = 151, WFA = 134, WLB = 21, and IBM = 18.

In contrast, H3 was to check the top three negative factors through which COVID-19 is affecting digital transformation. The top three negative significant (Figure 6) factors are NWL = 1.00, SEI = 0.32, and DST = 0.20. Looking at the descriptive data, responses for NWL = 196, SEI = 68, and DST = 41 and business model change (BMC) = 10. NWL is rated as high by most of the responses as the responses are 196. This is because working from home removes limits for working hours and schedule or control of time for the work.

Additionally, SEI is significant in a negative aspect and there are 68 responses for SEI. There are few studies [11,51,52] justifying social as well as employment issues due to pandemic. If we combine overall positive and negative relation, the pandemic is leading to positive disruption in DT, but it also leads to negative disruption as there is no work-life balance, as well as other and social and employment issues.

## 5. Discussions and Implications

The results clearly show that COVID-19 disruption is leading to technology adoption and disruption in the form of automation and collaboration [8,14,31]. In addition to TAC, COVID-19 is leading to working from anywhere [53] which removes the geographic barriers and office dependency. The geographic barrier may help to improve employment in developing countries. DT is enabling WFA as it depends on technology but removes brick and mortar kind of work culture. TAC (responses: 151) leads to WFA (responses: 134) which leads to WLB (responses: 21) as per descriptive responses. The vision of anywhere and anytime is not new [17] as it was visioned in the early 2000s. WFH leads to connecting employees 24 × 7 through mobility [54] or even sometimes connected through collaboration platforms 24 × 7. WFA has a direct negative effect on work-life balance as responses for NWL is 196. This is more than each of every other factor. Of the respondents, 21 reported that work-life balance was good, but 196 responses indicated a lack of work-life balance, which is quite alarming as NWL is leading to social issues.

It is important to mitigate social issues arising from NWL balance [55] by having a work schedule in a controlled manner. Many studies are suggesting having a better work-life balance [56] for health and wealth wellbeing. NWL is [57] rated highly satisfied by the young and old age group of employees but not by the middle age group. This study [57] was done during 2002, but our study shows that the majority of responses says NWL is rated high even though 79 percent of the respondent profiles have more than 10 years of employment. This means that over a period of time work-life balance deteriorates as a result of disruptions like COVID-19 together with the mainstreaming of digital technologies.

### *5.1. Practical Implication*

The instrument development is done by having a survey form to collect data rather than performing some form of qualitative studies due to the current stay-at-home orders and social distancing. In addition, there are numerous challenges presented by COVID to the supply chain [58], which are all implications for managers and policymakers. As this pandemic has lasted for over one year, it is not going to be eradicated immediately. Quantitative data collection is the only way to collect data and perform studies like this. The quantitative data (using survey form) were collected at the time of the pandemic situation in which the reaction from respondents may not reflect the facts, since negative motivation may take place. The quantitative data collection helps authors of this paper to collect sentiments of employees through the survey questionnaires rather than qualitive studies like face-to-face interaction which is not allowed during this pandemic situation. COVID-19

has created a mass disruption which erodes entire economies, leading to thinking of recovery of life rather than the economy. The responses may not be uniform across poorly to highly managed economies. A lot of other socio-economic issues may mix into COVID-19 issues. The responses are collected during COVID pandemic stage which may not be reflective of current situation since emotion erodes fairness in responses. The level or spread of pandemic is not uniform across the globe as the management of pandemic varied across economies. If the study of this impact analysis is needed at specific regional or economic levels, it would better to perform in specific economy or region.

The organization sustainability is relying on enabling DT as quickly as possible to run the business and help employees and customers to get connected. The positive or negative effect of DT is depending on not just common factors but also on the economy, digital level, and control of COVID-19 pandemic. If country levels of DT's impact in times of COVID-19 disruption is needed, this study can be extended to specific economies using this same research approach. Social sustainability depends upon how quickly COVID-19 is solved and how well society is connected seamlessly with or without this kind of pandemic situation. Again, the measurement of social sustainability with the impact of COVID-19 in DT can be researched further in specific economies if needed.

### *5.2. Theoretical Implication*

The theoretical model is derived based on collecting user responses in free text and grouping the responses into various factors by doing a meta-analysis of responses. The instrument development was done to collect responses for three positive and negative impacts of COVID-19 in DT. The responses are in free text. Then free text was analyzed using meta-analysis as in Table 5 and various responses in column 3 are codified as eight IVs, like "WFA, WLB, IBM, TAC, NWL, SEI, DST, and BMC" in column 2. The meta-analysis from the responses is based on evidence based practice as explained in Kitchenham's approach [59]. The various authors in this paper scrutinized responses by variables in both positive and negative factors in Table 5. The collected data are not reflective of non-employment pools such as homemakers, students, and so on, since data are only collected from employees. The identification of factors was from the outcome of responses with the knowledge that the author collected from limited literature in COVID-19 at this point.

## 6. Conclusions

There is no doubt that the testing of H1 proves that COVID-19 is the driver of digital transformation. Further analysis relating to H2 and H3 proves that the significance of positive impacts is greater than negative impacts. These impacts are directly related to employment and workplaces as the study is among employees. The study shows that technology, automation, and collaboration (TAC) is rated high within positive impacts of DT. This is then followed by working from anywhere (WFA) and new business models (IBM) in positive impacts of DT. This pandemic disruption cannot be avoided as business needs to continue as usual to some extent and it requires employees to work from home or anywhere. WFH or WFA require fundamental technology (TAC) to allow seamless working with the coworkers and customers. Technology, automation through technologies, and collaborative technologies are the important IT platforms as needed for every employee in the organization. Not only for employees, but eLearning acceptance [60] by students proves that COVID-19 is enabling DT directly. Changes in operation or business model [61] is very much driven by DT in the form on industry 4.0 in COVID-19 situation. TAC is one of the positive outcomes of COVID-19. The next significant factor is WFA which is expected to be a new normal in the COVID-19 situation. Overall, COVID-19 brings positive impact in WLB, WFA, and TAC. There will be some form of change in the business model or IBM is expected while the respondents rated work-life balance as a positive change. The contribution from this study is that DT is important to mitigate the pandemic situation as business needs to run as usual. Since the pandemic is widespread and global, employees need to connect globally which requires collaborative technologies. This study

informs employers and businesses of opportunities as new business models have emerged to mitigate the pandemic. The study also informs employers that mitigation in the form of technology transformation (DT) is a must for employees or even customer connections.

On the other hand, there is negative disruption as descriptive statistics show the negative impact in the COVID-19 situation since base-lined of NWL (no work life balance) = 1.00 as fixed parameter. This indicates that employee work-life balance is affected and important to be recovered by maintaining due diligence of employee engagement in the pandemic. It is important to engage employees within office hours and give room for balancing their life. NWL leads to social and employment issues (SEI = 0.32). The contribution of this study indicates clearly that employers must maintain due diligence of engagement to maintain work life balance. This will also improve social and health well-being. Societies, organizations, and economies are to be mindful of social and health well-being while using positive disruption as opportunities.

Looking at the result and implications, a qualitative study can be done once the COVID-19 regulations are relaxed. If the disruption of the pandemic in DT impact needs to be studied for specific regions or economies, this study's approach can be extended further for specific regions or economies. As the study is specific to the COVID-19 disruption in DT, it may not be directly related to other types of pandemics as the nature of disruption may vary.

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**Institutional Review Board Statement:** The ethical committee from Amrita Vishwa Vidyapeetham, India has reviewed "IEC-AIMS-2021-DOM-026, dated: 18-02-2021" and granted approval by stating that no ethical issues are involved in this study.

**Informed Consent Statement:** Please add "Informed consent was obtained from all subjects involved in the study." OR "Patient consent was waived due to REASON (please provide a detailed justification)." OR "Not applicable" for studies not involving humans.

**Data Availability Statement:** Please refer to suggested Data Availability Statements in section "MDPI Research Data Policies" at https://www.mdpi.com/ethics, (accessed on 15 July 2021).

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Questionnaires.

| Section 1 Is COVID-19 a Digital Transformation Driver? |
|---|
| Email Address: |
| 1. Year of Experience in Employment |
| Option 1: 0 to 10 years |
| Option 2: > 10 years |
| 2. Is COVID-19 a driver of digital transformation? |
| Option: 1 yes (Go to Section 2 if yes) |
| Option 2: No |
| Section 2 Top three positive and negative changes in digital transformation due to COVID-19 |
| 3. First positive change in digital transformation (Please provide in maximum 5 words) (Example, work from home) |
| 4. Second positive change in digital transformation (Please provide in maximum 5 words) (Example, work from home) |
| 5. Third positive change in digital transformation (Please provide in maximum 5 words) (Example, work from home) |
| 6. A first negative change in digital transformation (Please provide in maximum 5 words) (Example, no work-life balance) |
| 7. A second negative change in digital transformation (Please provide in maximum 5 words) (Example, no work-life balance) |
| 8. A third negative change in digital transformation (Please provide in maximum 5 words) (Example, no work-life balance) |

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