Organizational Digital Transformations and the Importance of Assessing Theoretical Frameworks such as TAM, TTF, and UTAUT: A Review

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Abstract—In this era of Industry 5.0, businesses worldwide are attempting to gain competitive advantages, increase profits, and improve consumer engagement. To achieve their goals, all businesses undergo extensive digital transformations (DT) by implementing cutting-edge technologies such as cloud computing, artificial intelligence (AI), the Internet of Things, and blockchain, among others. DT is a costly journey, including strategy, people, and technology. At the same time, many digitization efforts are failing miserably, resulting in project abandonment, loss of critical stakeholder trust, and the dismissal of important staff. Poor strategy, which may have pre-evaluated organizational flexibility and cultural misfits, is often criticized. As a result, it is critical to extensively investigate theoretical frameworks such as the Technology Acceptance Model (TAM), Task Technology Fit (TTF), and Unified Theory of Acceptance and Use of Technology (UTAUT), which were developed via significant research into various organizational kinds. All of these aspects are covered in this work by evaluating academic papers from the IEEE, Scopus, and Web of Science databases and reaching conclusions in future sections.

Keywords—Data growth; digital transformations; TAM; TTF; UTAUT; sustainability; FTM

I. INTRODUCTION

With the increasing rise of social media, proper data storage and retrieval in a modern data-driven company model are important for long-term viability and competitive advantage. In the ever-expanding business sector, AI and machine learning are emerging as feasible digital domains for information storage and recovery, promising to improve access to knowledge and effective decision-making [1]. A recent Google analysis shows DT themes and trends rapidly rising, the most contested subjects worldwide [2]. Digitalization provides greater functional assistance to clients while also illuminating performance and producing more substantial revenue streams [3]. The following factors have been recognized as driving the growth of unstructured big data and digitalization worldwide.

A. Data Growth

As data storage costs continue to decline due to the emergence of the cloud, organizations retain substantial volumes of transactional data for analysis and research [4]. Every industry type is seeing an increase in data due to the daily growth of e-transaction volumes in institutions. The dollar equivalent of electronic transactions will likely total roughly $118.3 billion globally in 2021, according to a recent Business Wire estimate [5], with developing markets increasing 15–20% faster than developed ones [6].

For a few decades, the objectives of businesses and the adoption of digitalization have changed due to the tremendous growth in data volume and quality. Because of these enormous data quantities, governance and regulatory organizations are under pressure to manage and preserve sensitive data. Data growth over the years depicts the price development for storing a gigabit of data from 1966 to 2020, as shown below. The cost of storing a gigabyte of data decreased drastically from $1.05 million in 1966 to $0.02 in 2017 [7]. Financial institutions are prompted by the cheaper storage costs to retain and process this enormous volume of data for important insight retrieval, organizational development, and decision-making [4].

B. Swing in the Business Model

The convenience and cost of online transactions are made possible by digitalizing essential products and services. Because of the aforementioned considerations and the developing global market, global institutions operate differently than they did a few decades ago. Self-service analytics and unstructured data storage are helping modern digital enterprises hold onto market share in the face of escalating intra- and inter-domain competition. With the evolution of smartphones, Know Your Customer (KYC), and Know Your Product (KYP), the pressure on businesses mounted to promote speed, efficacy, and quality by going digitalization [7]. Thus, in contemporary customer-focused business models, data security, storage, and meaning extraction are gaining center stage.

II. DIGITALIZATION AND ITS CHALLENGES

Data is the new gold as digitization approaches its zenith [8]. As data growth happens with constantly decreasing storage costs, organizations get the much-required push to be more data-driven than before in daily operations, as shown in Fig. 1. This study was significant because it expanded our understanding of the factors that push firms to adopt a data-driven approach to all facets of daily operations and works as catalyst for organizational sustainability. But making big data useful and facilitating faster information retrieval is now enterprises’ key issue [9]. According to the study mentioned above by Chowdhary [9], firms can examine consumer insights and behavioral trends but cannot take particular data-driven
action because of decision management issues. This failure can result from issues with organizational implementation or poor C-suite execution. Some businesses are also aware of the value of data and digitization. However, the difficulty they have in filling the positions is the absence of human resources with the necessary degree of expertise and strategy. Below are some discussions of why an organization’s digitalization journey fails and the cause of this.

![Cost per gigabyte of data storage over time](image.png)

**Fig. 1. Cost per gigabyte of data storage over time**

A. Lack of Transformation Objectives

Without a solid leadership vision or goal, achieving digitalization objectives is very hard. The fact that digital transformation never had a chance to succeed is one of the key reasons it failed [6, 7]. It is generally viewed as a publicity stunt that will give a company an air of optimism, imagination, and the future. Therefore, no clear objectives have been set to guide digital transformation efforts, which are typically solutions looking for a problem to solve. This leads to a company releasing the latest technology to release emerging innovations without having performance indicators in place. When the project is closely examined, it dragged out, exceeded budget, and ultimately failed.

B. No Planning for Change Management

Agile operation and change management are essential in the modern digitalization journey. Businesses may decide how their daily operations will run while introducing new technology with the help of a change management strategy [10]. Whether it’s a new ML model, Cloud adoption, ERP, or a different data pipeline build, a change management plan outlines how operations will run until the migration is successfully completed. If change management is properly outlined, the project is definitely going to lose its control, both concerning cost and time, and it is bound to fail.

C. Organizational Culture and Inner Endurance to Change

Recent research shows that 40–50% of Executives believe their teams never utilize the majority of the functionality offered by digitized products because of internal resistance to change [10]. This problem affects more than just product development, sales, or finance; it also affects disciplines like marketing, business development, and architecture design. Professionals typically think that their own systems they’ve created are more dependable than other software. Similarly, they could not have the training required to properly use a new product and opt to put it on hold for the time being. It is majorly a cultural thing affecting many companies globally and ultimately leads to digital transformation failure.

D. Too Fast in Bringing Transformation through Technology

To be the first to market (FTM), many firms set an accelerated schedule for a digital transformation program shorter than their implementation partners and consultants advise. As a result, because the leadership needs to be made aware of the technical effort involved in transferring to alternative IT systems, some of the critical processes or Key Performance Indicators (KPIs) required to make the switch are skimped on for enterprise adaptability and sustainability[10]. It leads to performance and quality compromise and ultimately leads to failure.

E. Poor Vision and Adoption of new Technology

Different corporate departments have various digitalization aspirations. For instance, marketing may desire to boost traffic regardless of whether it converts to customers, the engineering department may want to solve challenges that will improve performance, and the human resource team may want to meet hiring goals while not engaging with the rest of the company often [7, 10]. It could be challenging to get funding, get departmental buy-in, or commit to doing things to make a digital transformation program successful without a common organizational vision.

When only some people utilize the new IT solution as regularly as the leadership had planned, a company may effectively move to it just to run into a new challenge. When they are uncertain about the training they have received, employees understandably shy away from new technologies. Similarly, there is always a time when employees are reluctant to try out new tools in favor of tried-and-true methods. Organizations must create a strategy to enhance the digital adoption of new apps to achieve project Return on Investment (ROI). Sometimes it happens that junior staff members in an organization see the need for an improved alternative to the one they now use. They ask the leadership for a new response as a result. They are frequently declined, and even if they are grudgingly approved, the project does not obtain the required cash, help, and operational support to be effective throughout the whole organization. Sometimes these forced buy-ins adversely impact employee commitment and break the trust in the digitalization journey before it really starts [10].

F. Lack of Basics and Ignoring Customer Expectations

A digital transformation initiative should prioritize enhancing the company’s capacity to serve its key customers. Any digital transformation effort will only succeed if it enables us to give value to our customers, regardless of how much better the design is, how quickly you put it out, or how good our implementation partners were. If we ignore our core loyal customers and design a new digital app or product that lacks our domain-specific information, then it’s a waste of time and money, which will not meet business needs [8].

The biggest enterprises are leaders in technology, product, and innovation, but they also need a better history of losing millions to a failed digitalization journey [8, 9]. These businesses made unavoidable mistakes when using digitalization to empower their operations. The table below (see Table I) shows some of these world-famous brands and
the gaps in their journey to lose financially during their digital adoptions [10].

<table>
<thead>
<tr>
<th>Organization</th>
<th>Targeted for</th>
<th>Reason for Failure</th>
</tr>
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<tbody>
<tr>
<td>Hershey (1996)</td>
<td>Hershey was targeting more powerful ERP systems to replace their legacy IT systems.</td>
<td>1- No clear vision and trying to execute a pet project. 2- The transformation was rushed without proper testing.</td>
</tr>
<tr>
<td>HP (2003)</td>
<td>HP planned to stop legacy ERP systems and move to SAP for better customer and sales tracking.</td>
<td>1- Migration exceeded the target time frame. 2- Bad change management planning. 3- Didn't plan for a backup if this ERP implementation fails.</td>
</tr>
<tr>
<td>Miller Coors (2013)</td>
<td>Miller Coors planned digitalization through new app development and advanced ERP implementation to boost the supply chain.</td>
<td>The project went 3 years without any end with bad vendor selection and bad planning, ending with a lawsuit.</td>
</tr>
<tr>
<td>Revlon (2018)</td>
<td>Revlon was targeting to migrate its new ERP solutions to 22 countries where they operate.</td>
<td>Due to bad planning, poor change management, and implementation issues, the company lost $64 million, and the market cap dropped by 6.9%.</td>
</tr>
</tbody>
</table>

III. THEORETICAL FRAMEWORKS AND THEIR ASSESSMENT

Academics develop theoretical frameworks through in-depth research, surveys, and testing. Theoretical frameworks aid in understanding the implicit theory in adopting, developing, or clarifying expressly stated norms before implementing new initiatives, strategies, and regulations. It aids in reducing biases that might skew our interpretations in a novel environment owing to cultural and technological incompatibilities in an organizational or public context. One theoretical framework may be used to analyze other theoretical frameworks, which can change our perspective and reduce the risks of theory selection and application [11]. Theoretical frameworks help us recognize the boundaries of our study's scope by helping us understand the nature of our research problem. Better and clearer theoretical framework analysis helps us improve our decisions, develop better strategies, and understand our objectives.

Digital transformations are expensive, people-focused, and strategy-driven. It is, therefore, quite challenging to select the ideal theoretical framework to analyze the benefits of a digitalization project. Quantitative program or project design and theoretical underpinnings are interrelated. The study's goals and a comprehensive literature review are used to select the research design. Quantitative project planning employs deductive reasoning, which starts with choosing the theoretical framework that will provide the project with a solid foundation and direction. The early sections of a quantitative research proposal include theoretical frameworks to provide the justification for the inquiry. To direct the methods we use, choosing the right theoretical framework is essential. Thus, the study of the right methodology will provide conclusions that are compatible with the organization, its end goal, and its culture. The details about the theoretical framework needed to study before adopting digital transformations are discussed below in detail.

A. TAM

Decision-making about digital transformation and organizational sustainability can be enhanced using Davis' [11] Technological Acceptance Model. The study's guiding principle is usefulness and usability, which served as the foundation for the TAM model. TAM was first designed to provide a logical framework for evaluating the user acceptability of a certain information system or piece of information technology [12, 13]. TAM is developed and utilized regularly in fields other than IT, such as healthcare, retail, and finance. Perceived utility (PU) and perceived ease of use (PEU) are the two main components of TAM (see Fig. 2). PEU). These criteria were all created to characterize the usability and effectiveness of new procedures or technologies. External factors impact both PU and PEU, favorably affecting users' feelings about using the target system. Additionally, the variables affect users' use behavior (UB) on the target system and process [13]. Fig. 2 shows how individuals and organizations feel about using the TAM model to analyze unstructured data and gain insights for better outcomes.

![Fig. 2. Technology acceptance model and key attributes](image)

According to contingency theory, the compatibility of an organization and its environment is a necessary condition for organizational performance. Verma et al. [14] investigated the adoption of self-serve analytics and digitalization by utilizing the TAM model to examine how system features affected managers' opinions. Despite the past effort, research has yet to employ a complete strategy to experimentally evaluate the technical fit, organizational fit, and environmental fit views. To evaluate the influence of technology fit, organization fit, and environment fit on applying data analysis, KPIs, and insights for data-driven performance outcomes, the TAM and TTF models were merged in this study.

B. TTF

More effectively than technical, environmental, and individual factors, Task Technology Fit (TTF) is a framework that encourages innovation and adaptability [14]. Adopting cutting-edge technology by a business is influenced by various elements, including financial competence, organizational growth, technical services, and external environmental factors [15]. The primary external factors influencing adoption were a relative advantage, competitive pressure, and government support. Individuals' behaviors in converting inputs into outputs were referred to as task characteristics [16]. This study
aimed to predict performance using a combination of organizational structure, technology utilization, and the application of information technology to strategy better to account for the unpredictability of the external environment. The task-technology fit hypothesis was developed in the adoption of information systems, and the use of the idea of fit to assess a technology's influence on business performance has increasingly increased [16]. Generally speaking, this idea contends that the effectiveness of an information system depends on how effectively a job and technology interlock (see Fig. 3).

From the TTF perspective, novelty, output quality, and compatibility are crucial requirements for effective knowledge use and better outcomes. According to Wu and Chen [17], it still needs to be determined which elements, based on the TTF model, affect the performance of technology-driven companies. According to Wu and Chen, increasing TTF from the perspectives of technical, organizational, and environmental fit may impact technology-driven performance in any corporation to close the gaps. The Fintech mechanism is driven by business, and technological advancements are essential to any current Fintech perspective [18]. Excellent customer service and the development of distinctive products are essential for a firm to succeed in the Fintech industry.

C. UTAUT

The TAM model is the foundation for the UTAUT, which is enhanced by “adding social influence and positive factors” [19]. A technological acceptance model using UTAUT was created by Venkatesh et al. [20] and describes users' intentions to adopt information technology, digital transformation, and subsequent user behavior. The theory strongly emphasizes four key concepts: (a) performance expectancy, (b) effort expectancy, (c) social characteristics, and (d) enabling conditions. This section first three components cover usage behavior, while its final element emphasizes user behavior (see Fig. 4). UTAUT, sometimes referred to as child TAM, accounts for 50% of the variance in actual usage or user behavior (UB) and 70% of the variance in behavioral intention (BI) [21, 22].

A study of customer behavior is essential in this situation because it clarifies studies that show that customers' perceptions of performance improvement from technology are based on performance expectations [20]. TTF is used for utilities, UTAUT is used for companies, and the TAM framework is utilized for persons. The main focus of the new UTAUT model is on the economic or social effects of technology use. Fig. 4 shows how data-driven finance has changed from Fintech to TechFin [18-23] due to the major changes in the worldwide regulatory environment in the finance industry following the 2008 financial crisis.

Decentralized norms and regulations provide AI, IoT, and modern technologies a platform to participate in money absorption, securities dealing, and illegal fund-raising that goes beyond what applies to it [20]. This study’s concept and framework provide a new business and technical innovation paradigm. The study’s findings provide theoretical underpinnings and practical advice for further education. Every corporation's technology and resources are its true assets [24], and business goals, procedures, and technical innovation determine the results.

IV. KEY TAKEAWAYS FROM TAM, TTF, AND UTAUT

- Both internal and external elements are included in the TAM model. To ascertain if a new endeavor or computer project will be embraced by its potential users, TAM places a high value on "perceived utility" and "perceived ease of use." The TAM model examines exterior elements, including utility, content, pricing, and design, to examine their links with perceived usefulness and perceived usability [16]. Before we continue to investigate the idea of reasoned action, these external elements that impact organizational culture or commercial acceptance must be addressed (TRA) [25]. The TAM has a weakness, though, in that social influence is disregarded and has less of an impact in corporate settings today because it is based on individual ideas.

- In the current research, TTF is determined by evaluating how well the system function satisfies the demands of each specific activity [15]. Both corporate settings and specific workers can benefit from TTF. Every action we take inside the business must be assessed from both corporate and personal viewpoints to ensure that it meets the needs of all stakeholders. TTF is the connection between a task's needs, a person's aptitudes, and a digital device's and its software's capability. Additionally, TTF has been connected to the standard of personal performance, which may be applied in a wider framework of thinking about how information technology affects human performance [26]. The clear message here is that anything incompatible with people cannot be useful in an organizational setting.

Fig. 4. Organizational technology adaptation applying the UTAUT model [18]
• The UTAUT model is crucial because it compares the most popular technology acceptance theories and offers empirical insights into how people embrace new technologies. An important aspect of this paradigm that affects whether people or organizations should utilize the new system is the effect of social or competitive factors [15, 26]. A low or high social influence score may impact a company's journey toward digital transformation. This study describes how social impact influences executives' and workers' motivation, ultimately affecting organizational decision-making. Fig. 4 loudly highlights the impact of social influence and organizational cultural change as an output of that (see Fig. 5, which explains that the journey of necessity starts with a journey of influence).

• The veracity and viability of theoretical models for digitalization validation increase along with technological advancement. The interactivity, adaptability, and brilliance of digital systems are now considered prior elements in the UTAUT model. All three above models showed that attitude was fundamental to behavioral intentions and usage behaviors, partially mediated the effects of exogenous constructs on behavioral intentions, and directly affected organizational usage behaviors. This was shown to be true in both direct and indirect ways. Numerous implications for theory and practice are made using the study findings, and conclusions are formed.

V. LIMITATIONS

The construction and analysis of theoretical frameworks aid in clarifying our implicit theory in a more specified manner. It is beneficial to evaluate other alternatives as well to avoid biases that may influence our understanding. However, it's different, and we need to realize that no one model that fits all. These frameworks are ancient and were created with a few scenarios in mind. However, contemporary organizations have complicated processes and needs. So, no single model can address all of their questions here. As a result, planners, project managers, and executives must investigate all three frameworks and associated alternatives to prevent biases while attempting to match these models with some considerations and aspects to be avoided.

VI. RECOMMENDATIONS

Because of the worldwide influences of 5G, smartphones, and shifting client sentiments, digital transformation is very necessary for modern enterprises [24]. Companies increasingly use people, technology, and procedure to their advantage in a multidimensional environment. But because it is expensive and cultural in character, affecting all aspects of the company domains, it is crucial to prepare it well. It is very much recommended to employ tested techniques and frameworks to analyze any positive and negative effects of any such major projects before beginning them. The existing organizational stance, its short- and long-term goals, and the cultural background may all be accessed using the theoretical frameworks TAM, TTF, and UTAUT [27, 28]. It is strongly advised that companies thoroughly research these works before selecting the right technology, vendor, and change management process to avoid misfiring in the future [29, 30]. Additionally, study results may affect behavior motivators and outside variables when analyzing executive-level intents and may serve as a basis for future analyses of the DT projects.

VII. CONCLUSION

The practical assessment of theoretical frameworks, their drawbacks, the consequences for ongoing research, and sensible advice are highlighted in this study. This paper emphasizes the value of theoretical frameworks and explains why they are essential in post-pandemic organizations before beginning any new, expensive, and labor-intensive digitalization endeavor. Building software using these frameworks during pre-project strategy is crucial to achieving both qualitative and quantitative goals. As these models provide comprehensive perspectives of technology acceptability, technology use, and behavioral intents, future research is advised to improve data collecting from Fortune 500 businesses internationally and dialogues, including executives and stakeholders.

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