Universidade do Minho
Escola de Ciências

Nilton Hideki Takagi

Digital transformation: The influence of organizational initiatives on project success

December, 2023

Digital transformation: The influence of organizational initiatives on project success
Nilton Hideki Takagi
UMinho | 2023

Universidade do Minho
Escola de Ciências

Nilton Hideki Takagi

Digital transformation: The influence of organizational initiatives on project success

A thesis presented for the degree of
Master of Science in Statistics for Data Science

Supervised by
Dr. Raquel Menezes Mota Leite
Dr. João Eduardo Quintela Varajão

December, 2023

Copyright

Acknowledgments

I would like to thank Professors Raquel Menezes and João Varajão, supervisors of this work, for their professionalism, dedication, and prompt availability. I also include in this list of acknowledgments Professor Susana Faria, for her singular contribution to the result of the work. For each knowledge sharing, guidance in conducting the work, observation in my writing, patience, and good humor in the various moments of interaction, goes my many thanks to the three.

Integrity Statement

I declare that I have acted with integrity in the preparation of this academic work and confirm that I have not practiced plagiarism or any form of inappropriate use or falsification of information or results in any of the stages leading to its preparation.

I further declare that I am aware of and have respected the Code of Ethical Conduct of the University of Minho.

Digital transformation: The influence of organizational initiatives on project success

Abstract

Digital transformation (DT) is linked to how technologies and information systems can be exploited to meet organizational needs and leverage business opportunities. DT projects are complex and technology is only one part of them. Another part is linked to business processes, organizational capacity and organizational culture. Embedding information technology in an organization over poorly established processes can be the first step to failure in DT projects. The organization should realize what is important to evolve before starting DT projects.

In this work, a conceptual model was developed based on the information processing theory, defining organizational initiatives that can impact the success of DT projects. To evaluate the model, a survey was applied to professionals with experience in DT projects. With 205 valid responses, data analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in R software with the SEMinR library. The bootstrap procedure was used to obtain 95% confidence intervals around the parameter estimates. The results found have theoretical implications, with the use of information processing theory and several hypotheses confirmed, and practical implications, such as direct impacts on the Business Process Management (BPM) life cycle.

Keywords: digital transformation; project success; information processing; project management; organizational performance, PLS-SEM

Transformação digital: A influência das iniciativas organizacionais no sucesso dos projetos

Resumo

A transformação digital (DT) está ligada em como as tecnologias e sistemas de informação podem ser explorados para atender às necessidades organizacionais e alavancar oportunidades de negócios. Os projetos de DT são complexos e a tecnologia é apenas uma parte deles. Outra parte está ligada a processos de negócios, capacidade organizacional e cultura organizacional. Incorporar a tecnologia da informação em uma organização sobre processos mal estabelecidos pode ser o primeiro passo para o fracasso em projetos de DT. A organização deve perceber o que é importante evoluir antes de iniciar os projetos de DT.

Neste trabalho foi desenvolvido um modelo conceptual com base na teoria de processamento de informações, definindo iniciativas organizacionais que podem impactar no sucesso de projetos de DT. Para avaliar o modelo, um questionário foi aplicado à profissionais com experiência em projetos de DT. Com 205 respostas válidas, a análise de dados foi realizada utilizando modelagem de equação estrutural de mínimos quadrados parciais (*Partial Least Squares Structural Equation Modeling* - PLS-SEM) no software R com a biblioteca SEMinR. O bootstrap foi utilizado para obter intervalos de confiança de 95% em torno das estimativas dos parâmetros. Os resultados encontrados têm implicações teóricas, com o uso da teoria de processamento de informações e diversas hipóteses confirmadas, e implicações práticas, como impactos diretos no ciclo de vida da gestão de processos de negócio (*Business Process Management* - BPM).

Palavras chave: transformação digital; sucesso do projeto; processando informação; gestão de projetos; desempenho organizacional, PLS-SEM

Contents

List of Figures

List of Tables

Abbreviations

BPM	Business Process Management
DT	Digital Transformation
DTS	Digital Transformation Project Success
IPN	Reduce Information Processing Needs
IPC	Improve Information Processing Capability
IST	Information Systems and Technologies
IT	Information Technology
MDI	Digital Technology Infrastructure Management
PLS-SEM	Partial Least Squares Structural Equation Modeling
SAD	Digital Technology-Business Strategic Alignment

1. Introduction

In the last decades, organizations have been conducting many initiatives to explore the benefits of new technologies. These initiatives are often managed as digital transformation (DT) projects and impact the key business operation and products, services, organizational structure, and management concepts (Matt, Hess, & Benlian, 2015). These changes in organizations are complex, as many organizational variables are involved (e.g., organizational areas, processes, technologies). In addition, organizations typically launch multiple concurrent transformation initiatives resulting in more complexity (Jöhnk, Oesterle, Ollig, & Riedel, 2020). Failure to properly exploit Information Technology (IT) directly impacts the efficiency of business processes and organizational performance – organizations invest over $1 trillion annually in DT, with a failure rate of over 90% (Ramesh & Delen, 2021).

DT is not about technology (Tabrizi, Lam, Girard, & Irvin, 2019), but rather, it encompasses more than just IT. Digital initiatives must be complemented by skilled executives and employees to reveal their transformative power (Nadkarni & Prügl, 2021). Executives and employees play a crucial role in DT success factors such as providing strategic support and processing knowledge of the organizational operation (Osmundsen, Iden, & Bygstad, 2018). Establishing strategic and structural initiatives within the organizational operation before exploring new technologies can effectively decrease the complexity of DT projects. This, in turn, leads to an increased success rate and better organizational results (Fischer, Imgrund, Janiesch, & Winkelmann, 2020).

Our research focuses on maximizing the success of DT projects. The information processing theory (Galbraith, 1974) was used as the basis to identify organizational initiatives to prepare organizations for DT projects. Four initiatives were selected and characterized from previous works by Galbraith (1974) and Li, Wu, Cao, and Wang (2021). The initiatives regard reducing information processing needs, improving processing capacity, ensuring strategically aligning technology and the business, and preparing the technology infrastructure. These initiatives were combined and validated in a conceptual model. This analysis addresses the following research question: Which organizational initiatives impact the success of digital transformation projects?

The conceptual model and hypotheses were analyzed through a survey applied to digital transformation experts. In total, we received 205 responses. These responses were validated employing partial least squares structural equation modeling (PLS-SEM). Software R and library SEMinR were used in this work.

Our findings and contributions to the body of literature are twofold. Firstly, to the best of our knowledge, the organizational initiatives predicted in Galbraith's (1974) information processing theory and the strategy and operation variables incorporated in Li et al. (2021) have not been used together to explain the success of DT projects. By validating these initiatives' impact, we significantly contribute to the theory and DT projects success. Secondly, we have built a comprehensive and scalable model that offers a consistent characterization of the organizational initiatives dimension, which DT researchers can use in the future. Our research also contributes to the literature by studying the impacts of organizational initiatives in the DT context. By examining both the strategic level (e.g., digital technology-business strategic alignment) and operational level (e.g., information processing needs and capability), it assesses the main effects of organizational characteristics and structure, as well as their direct and indirect effect on DT project success.

2. Background

2.1 Digital transformation

Digital Transformation projects typically involve aspects of IT, innovation, and organizational change, requiring the integration of multiple perspectives (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017). DT involves the modification (or adaptation) of business models resulting from the dynamic pace of technological progress and innovation (Kotarba, 2018). It requires rethinking organizational roles, processes, and services from a technology-enabled perspective (Parviainen et al., 2017). Some of the challenges of a DT are related to staff resistance, external pressures (e.g., time, budget), and preparing workers (users) to ensure they can effectively use the system (Eden, Jones, Casey, & Draheim, 2019). These challenges and the dynamic relations between the dimensions of organization, technologies, and innovation define DT projects as complex (Hafseld, Hussein, & Rauzy, 2021).

The complexity of projects impacts several aspects of project management (San Cristóbal, Carral, Diaz, Fraguela, & Iglesias, 2018). It can influence the project's planning, coordination, and control activities, affect the identification of appropriate requirements for the project management team, and influence the project's success (e.g., time compliance, customer satisfaction, realized benefits). Besides project management aspects, several issues can impact DT projects. Lack of resources and organizational capabilities can directly affect DT projects (Hafseld et al., 2021). On the other hand, an effective IT infrastructure can support the business strategy, while a poor IT infrastructure can impede the organization's progress (Holland & Light, 1999). Assessing the adequacy of processing capacity, IT infrastructure, and available resources are examples of organizational initiatives considered in our research. Addressing these organizational issues can reduce DT projects' complexity and increase the project success rates (Fischer et al., 2020).

2.2 Project success

Project success is contingent, depending on the project area (Albert, Balve, & Spang, 2017) and the stakeholders' views (PMI, 2021; Takagi & Varajão, 2022), as each stakeholder may have different perspectives at different times for different projects

(Shenhar, Dvir, Levy, & Maltz, 2001; Takagi & Varajão, 2020). In the literature the success criteria have emerged, including meeting schedule, meeting budget, customer satisfaction, and organizational benefits (Baccarini, 1999; Cooke-Davies, 2002; de Wit, 1988; Marquis & Straight, 1965; Pankratz & Basten, 2014; Pereira, Varajão, & Takagi, 2022; Thomas & Fernández, 2008; Wateridge, 1995).

For the management of information systems and technologies projects, Atkinson (1999) suggests the importance of considering success criteria beyond the usual ones, such as cost and time. In the area of Information Systems and Technologies (IST), Iriarte and Bayona (2020) conducted a literature review that includes an extensive list of success criteria. Among them, customer satisfaction and user satisfaction are recurrently used as success project criteria. Wateridge (1998) evaluates the importance of these criteria in IST projects from different actors (users and project managers) and perspectives (success or failure). Despite their varying importance depending on the project situation and the stakeholder's view, they continue to be used to evaluate success in IST projects (Pereira et al., 2022).

The evaluation of success depends on the stakeholders' perception (Mallak, Patzak, & Kurstedt Jr, 1991; PMI, 2021; Takagi & Varajão, 2022), which makes customer satisfaction one of the most commonly used criteria in project management over the years (de Wit, 1988; Marquis & Straight, 1965; Pereira et al., 2022; Takagi, Varajão, Ventura, Ubialli, & Silva, 2021; Thomas & Fernández, 2008; Wateridge, 1998). In research of IST project managers, Pankratz and Basten (2014) suggest that customer satisfaction can be directly impacted by good communication and the extend to which the project execution team knows about the customer's systems. Still in the IST area, DeLone and McLean (1992, 2003, 2016) present a success model with end-user satisfaction with IST as an important variable for success.

The organizational benefits of DT projects may be related to improving efficiency through digital processes, creating new services, or even disruptive business change (Parviainen et al., 2017). In these organizational change projects, change management, process redesign, and IT infrastructure are critical to the project's success (Xiang, Archer, & Detlor, 2014). In the IS success model, Delone and McLean (2003, 2016) present net benefits/impacts as a measure of the contribution of information systems to the success of individuals and organizations (e.g., improved decision-making, improved productivity, cost reductions, improved profits). Our research uses stakeholder satisfaction and organizational benefits to evaluate DT project success.

3. Theoretical model

Our research addresses organizational initiatives that contribute to DT project success. In the developed conceptual model (Figure 1), organizational initiatives are the variables that influence the dependent variable DT project success. The dependent variable DT project success is defined in terms of five success criteria: client satisfaction, end-user satisfaction, team project satisfaction, benefits achieved, and use of project result (product/service). The independent variables are related to several organizational areas and structures. The initiatives regarding information processing come from the work of Galbraith (1974), while the initiatives concerning strategic alignment and technological infrastructure are based on the research of Li et al. (2021). The works of Galbraith (1974) and Li et al. (2021) complement each other, providing a comprehensive characterization of the organizational dimension and a useful combination for evaluating the success of DT projects.

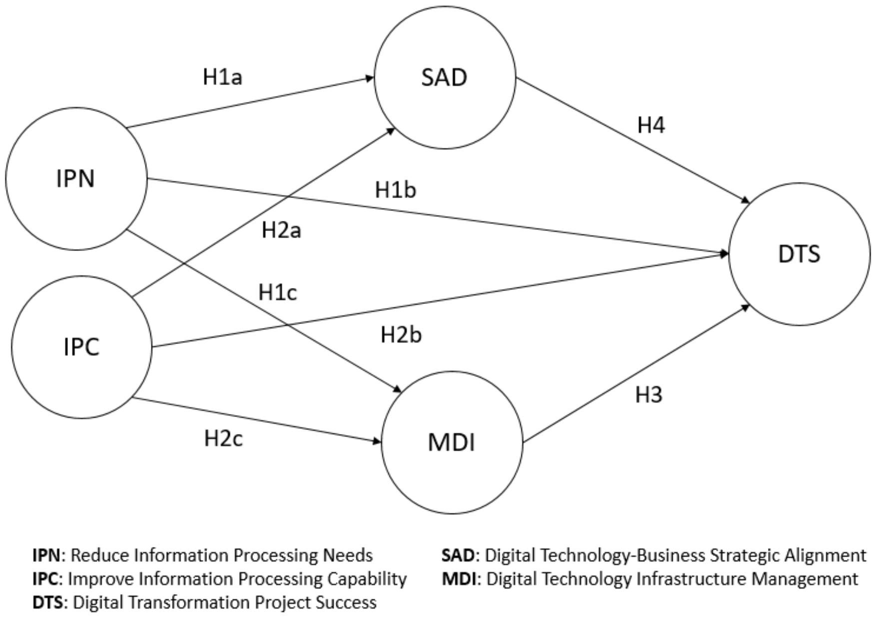

Figure 1. Research model

3.1 Reduce information processing needs

To design an efficient organizational structure, one of the diagnostics is to realize the communication needs between the functional areas and the functional sub-areas (information processing needs) (Tushman & Nadler, 1978). Information processing encompasses the gathering, interpreting, and synthesizing of information (Tushman & Nadler, 1978). Information processing theory deals with the link between organizational uncertainty and information processing needs, as well as how organizations address these needs (Bensaou & Venkatraman, 1995). In this work, information processing needs were characterized and measured using the initiatives proposed by Galbraith (1974). The initiatives include the creation of resource slack with a focus on reducing constraints and the resulting need for fewer exceptions and less communication required; and the creation of self-contained tasks with sufficient resources to solve an end-to-end process. Considering the above statements and the context of our research, we state the following hypothesis:

H1a: Information processing needs positively influence digital technology-business strategic alignment.

H1b: Information processing needs positively influence digital transformation project success.

H1c: Information processing needs positively influence digital technology infrastructure management.

3.2 Improve information processing capability

Information processing capability is closely related to uncertainty, which increases the need for a higher information processing capability, and to organizational structures, which may possess different information processing capabilities (Tushman & Nadler, 1978). Initiatives to improve organizational information processing capability are based on the work of Galbraith (1974). The initiatives encompass the assurance of access to advanced technological tools capable of managing substantial volumes of information, coupled with the establishment of specialized task forces designed to address challenges spanning multiple business domains. Regarding the above statements and the context of our research, we state the following hypothesis:

H2a: Information processing capability positively influences digital technology-business strategic alignment.

H2b: Information processing capability positively influences the digital transformation project success.

H2c: Information processing capability positively influences digital technology infrastructure management.

3.3 Digital technology-business strategic alignment

Digital technology-business strategy transcends the traditional areas (e.g., finance, marketing, logistics) and is much more cross-functional than IT strategy (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Pesce & Neirotti, 2023). In our research, organizational initiatives related to digital transformation at the strategic level are based on the work of Li et al. (2021). Some examples of initiatives include 1) creating a communication channel between IST managers and top managers to reduce the flow of unnecessary information, and 2) establishing a clear organizational vision about the strategic role of IST, thereby increasing trust and reducing conflicts between the IST area and other areas of the business. Regarding the above statements and the context of our research, we state the following hypothesis:

> **H3**: Digital technology-business strategic alignment positively influences digital transformation project success.

3.4 Digital technology infrastructure management

DT should not be viewed solely from a short-term competitive advantage perspective but designed to look ten years ahead (Kretschmer & Khashabi, 2020). This approach includes management of digital technology infrastructure. In our research, organizational initiatives aimed at designing the infrastructure to support digital transformation initiatives are based on the work of Li et al. (2021). Some examples of the initiatives include provisioning an IST infrastructure that prepares the organization for future challenges and providing a flexible IST infrastructure that allows for quick adaption when needed. Considering the above statements and the context of our research, we state the following hypothesis:

> **H4**: Digital technology infrastructure management positively influences digital transformation project success.

3.5 Mediation of digital technology-business strategic alignment and digital technology infrastructure management

The digital technology-business strategic alignment can mediate the quality and problems of IST projects and the business impact of IST (Kearns & Sabherwal, 2006). On the another hand, mediated by teamwork quality, flexible IST infrastructure can influence IST project success (Xu, Zhang, & Barkhi, 2010). However, to the best of our knowledge, the mediation effect of digital technology-business strategic alignment and digital technology infrastructure management has not been tested with information processing theory variables, such as reducing information processing needs and improving information processing capability. We therefore hypothesize:

H5a: Digital technology-business strategic alignment positively mediates the relationship between reduce information processing needs and digital transformation project success.

H5b: Digital technology-business strategic alignment positively mediates the relationship between improve information processing capability and digital transformation project success.

H5c: Digital technology infrastructure management positively mediates the relationship between reduce information processing needs and digital transformation project success.

H5d: Digital technology infrastructure management positively mediates the relationship between improve information processing capability and digital transformation project success.

4. Research method

Considering the research focus and model, we opted to employ an anonymous self-reported survey to collect empirical data. The survey is available in the appendix 1. Additionally, we utilized multivariate analysis methods to statistically test the proposed model, an approach widely accepted in the literature (Lowry, Zhang, Wang, & Siponen, 2016).

4.1 Measures and data collection

The measurement items used in our research are derived from relevant literature. Specifically, the items for "Reduce Information Processing Needs" (IPN) and "Improve Information Processing Capability" (IPC) were adapted from Galbraith (1974). The items for "Digital Technology-Business Strategic Alignment" (SAD) and "Digital Technology Infrastructure Management" (MDI) were adapted from Li et al. (2021). The item for "Digital Transformation Project Success" (DTS) originated from Atkinson (1999) and Iriarte and Bayona (2020). The evaluation of each construct is detailed in Table 1.

Table 1. Constructs and evaluation items

Construct	Items	Adapted from
Reduce Information Processing Needs	IPN1 - Decrease the constraints (e.g. budget, human resources, etc.) of functional areas to minimize the need for communication between organizational units. IPN2 - Identification and elimination of activities that do not add value to the business. IPN3 - Creating self-contained processes (containing all the necessary elements to be completed).	(Galbraith, 1974)
Improve Information Processing Capability	IPC1 - Formalizing language and concepts to improve the decision-making process. IPC2 - Availability of technological tools to handle high volumes of information, in the context of decision making. IPC3 - Creation of temporary task forces to solve problems involving several areas of the business. IPC4 - Creation of the liaison profile, to be the interface between two or more interdependent departments in case of significant communication needs.	(Galbraith, 1974)
Digital technology-business strategic alignment	DSA1 - Creating a communication channel between IST managers and top managers to reduce the flow of unnecessary information. DSA2 - Promoting collaboration between IST managers and business managers in order to facilitate the exchange of information and knowledge. DSA3 - Alignment between the IST area and business managers in the context of strategic decision making. DSA4 - Clear organizational vision about the strategic role of IST, increasing trust and reducing conflicts between the IST area and other areas of the business.	(Li et al., 2021)
Digital technology	MDI1 - Provision of a IST infrastructure that properly supports the information needs of the business.	(Li et al., 2021)

Construct	Items	Adapted from
infrastructure management	MDI2 - Provision of a IST infrastructure that prepares the organization for future challenges. MDI3 - Providing a flexible IST infrastructure that allows you to quickly adapt when needed. MDI4 - Provision of a IST infrastructure that enables proper integration of TSI services across the organization	
Digital transformation project success	DPS1 - The project finished on budget. DPS2 - The project finished on schedule. DPS3 - The deliveries met the established quality criteria. DTS4 - The client was satisfied with the results of the project. DTS5 - The execution team was satisfied with the results of the project. DTS6 - The end users were satisfied with the results of the project. DTS7 - The project allowed the planned organizational benefits to be achieved. DTS8 - The result of the project (product/service) was used by the client.	(Atkinson, 1999; Iriarte & Bayona, 2020)

The target audience for data collection comprised professionals with experience in DT projects, without any specific industry or country restrictions. We used the professional social network LinkedIn to identify respondents and searched for DT practitioners. Each respondent was requested to answer the survey based on the most recent DT project in which they participated.

The 7-point Likert Scale was employed to gauge the respondents' level of importance for each organizational initiative, ranging from 1 (indicating no importance) to 7 (indicating the highest importance). The perceived level of project success was assessed using a scale ranging from 1 (totally disagree) to 7 (totally agree).

Before distributing the final survey, we conducted a pre-tested to ensure its validity. The pre-test involved professionals experienced in DT, who were asked to provide feedback using clear and objective language in order to enhance the survey's clarity and understandability. The pre-test was incremental, with each round involving a different professional. After each round, the feedback provided was incorporated before the next round of the pre-test. With each round, the feedback was improving, finalizing the pre-test process in five rounds, involving five different DT professional experts.

4.2 Participants

Initially, we tried to collect data through social media participants, in groups with professionals working in digital transformation. However, this approach had no effect, with few participants. So the strategy adopted was to contact professionals with some experience in digital transformation one by one by private message. A total of 643 invitations were sent on December 2022. The final survey was conducted online from

December 2022 to February 2023. Two hundred and five valid responses were received, which corresponds to a 31.9 percent response rate.

The characteristics of the respondents are presented in Table 2. Nearly 85% of the respondents are over 30 years old. Most respondents are men, accounting for approximately 83%. The most common occupations among the respondents are IT manager, project manager, and programmer/developer comprising about 53% of the sample. An overwhelming majority, almost 99%, hold an undergraduate degree, while approximately 16% possess a master's degree, and over 9% hold a doctoral degree. The most prevalent undergraduate degrees reported are informatics/computer science, representing 45% of the sample, and information systems at approximately 28% and administration/ business management at around 12%. Regarding experience in DT projects, almost 60% have six or more years of experience, and over 50% have worked in six or more projects.

Table 2. Socio-demographic characterization

Age	**n**	**%**	**Education**	**n**	**%**
< 31	31	15.12	12th grade or equivalent	3	1.46
31 - 40	71	34.63	Bachelor degree	149	72.68
41 - 50	74	36.10	Master degree	33	16.10
> 50	29	14.15	Doctoral degree	20	9.76
Gender	**n**	**%**	**Academic background***	**n**	**%**
Male	171	83.41	Informatics/Computer Science	91	45.05
Female	34	16.59	Information Systems	56	27.72
			Administration/Business Management	25	12.37
			Engineering (civil, mechanical, etc.)	15	7.43
			Others	15	7.43
			*Bachelor or higher degree		
Role	**n**	**%**	**Digital Transformation experience (years)**	**n**	**%**
IT manager	42	20.49	Less than 3 years	45	21.95
Project manager	40	19.51	3 - 5 years	39	19.02
Programmer/developer	27	13.17	6 - 10 years	48	23.42
Professor/researcher	25	12.20	More than 10 years	73	35.61
System analyst	23	11.22	**Digital Transformation experience (projects)**	**n**	**%**
Business sector manager	22	10.73	Less than 3 projects	42	20.49
Consultant	4	1.95	3 - 5 projects	56	27.32
Process analyst	3	1.46	6 - 10 projects	44	21.46
Others	19	9.27	More than 10 projects	63	30.73

The characteristics of the organizations where DT projects were implemented are presented in Table 3. Approximately 60% of these organizations have over 50 employees, while nearly 25% have an annual turnover exceeding 100 million Euros. The area of activity is very diverse, with approximately 20% operating in various government sectors (e.g., judiciary, planning, information technology, digital transformation office), around 18% in the education/research area, about 13% in the financial/insurance services, and 10% in the medical/health care sector.

Table 3. Characterization of the organizations

Organization employees	**n**	**%**	**Industry**	**n**	**%**
Less than 10 employees	25	12.19	Government	39	19.02
10-50 employees	46	22.44	Education/Research	38	18.54
51-250 employees	36	17.56	Finance/Insurance	28	13.66
251-500 employees	20	9.76	Medical/Health care	22	10.73
More than 500 employees	70	34.15	Computer-related (hardware, software)	14	6.83
Do not know / No answer	8	3.90	Agriculture/Livestock farming	13	6.34
Organization turnover (€)	**n**	**%**	Consumer retail/Wholesale	8	3.90
Less than 2.000.000 €	22	10.73	Energy/Gas	6	2.93
2.000.000 € - 10.000.000 €	30	14.63	Telecommunications	5	2.44
10.000.001 € - 50.000.000 €	20	9.76	Distribution/Warehousing	4	1.95
50.000.001 € - 100.000.000 €	10	4.88	Mineral extraction	2	0.98
More than 100.000.000 €	50	24.39	Construction	2	0.98
Do not know / No answer / Not applicable	73	35.61	Others	24	11.70

The characteristics of the DT projects considered in this study are presented in Table 4. Around 88% of these projects were executed in South America, while nearly 7% were carried out in Europe. More than 36% of the projects had a budget exceeding 250,000 Euros, and approximately 70% of the projects ranged from six months to two years.

Table 4. Characterization of the projects

Project location	**n**	**%**	**Project budget**	**n**	**%**	**Project time**	**n**	**%**
South America	181	88.29	Less than 50.000 €	35	17.07	Less than 6 months	20	9.75
Europe	14	6.83	50.001 € - 100.000 €	24	11.71	6 - 12 months	70	34.15
North and Central America	6	2.93	100.001 € - 250.000 €	10	4.88	13 - 24 months	70	34.15
			250.001 € - 500.000 €	32	15.61	25 - 36 months	23	11.22
Africa	1	0.49	More than 500.000 €	42	20.49	More than 36 months	22	10.73
More than one continent	3	1.46	Do not know / No answer	62	30.24			

4.3 Data analysis

We employed partial least squares structural equation modeling (PLS-SEM) to test our research model. PLS-SEM is widely used in IS research (Ringle, Sarstedt, & Straub, 2012). SEM allows researchers to simultaneously model, estimate and test complex theories with empirical data represented in structural equation models that depict hypothetical cause-and-effect relationships (Sarstedt, Ringle, Smith, Reams, & Hair, 2014). The use of PLS-SEM has gained prominence in various research disciplines, such as the study of behavior in IS usage (Ogbanufe & Gerhart, 2020; Tarafdar, Maier, Laumer, & Weitzel, 2020) and information security (Guhr, Lebek, & Breitner, 2019; Gwebu, Wang, & Hu, 2020). Rigdon, Sarstedt, and Ringle (2017) highlighted that PLS-SEM compared to covariance-based SEM, is particularly suitable for exploratory research. PLS-SEM was executed in version 4.1.2 of the R software employing the SEMinR library. Finally, the bootstrap procedure was used to obtain 95% confidence intervals around the parameter estimates. The R software commands using the SEMinR library to generate the results are shown in Appendix 2.

5. Research results

Evaluating the results of the loadings of the previous section, and in order to remove the least significant items from the original model, we removed the items IPN1, DTS1, and DTS2. The item DTS3 was removed because it is related to a traditional success criterion, in the literature always cited together with the success criteria associated with DTS1 and DTS2. By removing these classic items for evaluating the project success (e.g., budget, schedule), the relevance became focused on evaluating the expectations of stakeholders. This new model we can have noted the R^2 of DTS increased from 0.189 to 0.214.

5.1 Measurement model

The indicator reliability is a reflective measurement to examine how much of each indicator's variance is explained by its construct, with recommended indicator loadings above 0.708 (Hair Jr et al., 2021). All indicator loadings of the reflectively measured constructs are well above the threshold value of 0.708, as presented in Table 5. The indicator IPC4 has the smallest indicator-explained variance with a value of 0.685 (loading = 0.8272), while the indicator MDI4 has the highest explained variance, with a value of 0.886 (loading = 0.9412).

Table 5. Measurement model loadings and cross-loadings

Construct*	Indicator	IPN	IPC	SAD	MDI	DTS
IPN	IPN2	**0.819**	0.319	0.384	0.333	0.186
	IPN3	**0.851**	0.531	0.427	0.365	0.185
IPC	IPC1	0.449	**0.734**	0.540	0.392	0.094
	IPC2	0.423	**0.691**	0.436	0.405	0.219
	IPC3	0.253	**0.715**	0.496	0.377	0.169
	IPC4	0.326	**0.685**	0.481	0.357	0.149
SAD	SAD1	0.427	0.585	**0.795**	0.508	0.237
	SAD2	0.369	0.627	**0.863**	0.528	0.252
	SAD3	0.433	0.536	**0.853**	0.604	0.343
	SAD4	0.391	0.554	**0.816**	0.589	0.274
MDI	MDI1	0.385	0.457	0.622	**0.843**	0.431
	MDI2	0.305	0.426	0.482	**0.850**	0.352
	MDI3	0.386	0.515	0.579	**0.867**	0.328
	MDI4	0.360	0.465	0.611	**0.886**	0.450
DTS	DTS4	0.168	0.160	0.252	0.341	**0.862**
	DTS5	0.124	0.139	0.152	0.318	**0.819**
	DTS6	0.207	0.238	0.249	0.355	**0.866**
	DTS7	0.153	0.187	0.280	0.443	**0.877**
	DTS8	0.268	0.209	0.420	0.444	**0.836**

***IPN**: Reduce Information Processing Needs; **IPC**: Improve Information Processing Capability; **SAD**: Strategically Align Digital Technology-Business; **MDI**: Manage Digital Technology Infrastructure; **DTS**: Digital Transformation Project Success

Internal consistency reliability refers to the extent to which indicators measuring the same construct are positively associated with each other (Hair Jr et al., 2021). In this study, Composite reliability (rhoC) and Cronbach's alpha were used as reliability measures, with recommended values above 0.7 for both (Henseler, Ringle, & Sinkovics, 2009). Regarding Composite reliability (rhoC), all values were found to be above 0.7, as recommended. The construct IPC exhibited the smallest indicator value of 0.799, while DTS has the highest indicator value of 0.930.

Composite reliability (rhoC) was also used to analyze the final structure, with all values above 0.7 as recommended (Henseler et al., 2009). Regarding Cronbach's alpha, the constructs SAD (0.852), MDI (0.884), and DTS (0.907) exhibited coefficients above 0.7 (Henseler et al., 2009). However, the constructs IPN (0.566) and IPC (0.666), had values lower than the recommended threshold. Nonetheless, such values are deemed acceptable in exploratory research (Gliem & Gliem, 2003; Hair Jr et al., 2021).

Convergent validity is the extent to which the construct converges in order to explain the variance of its indicators (Hair Jr et al., 2021). Average Variance Extracted (AVE) was employed to evaluate the convergent validity. AVE should be above 0.5, indicating that the latent variables explain more than half of the variance of their indicators (Fornell & Larcker, 1981; Hair, Ringle, & Sarstedt, 2011). The item IPC was found to be close to the threshold at 0.499, while the other indicators were above 0.5. The maximum AVE value was observed in the MDI construct, with a value of 0.742.

To assess discriminant validity was compared each construct's AVE (squared variance within) to the squared inter-construct correlation (as a measure of shared variance between constructs) (Hair Jr et al., 2021). The square root of AVE values should be greater than the pair correlation of the constructs (values different from the diagonal) (Chin, 2010), which was indeed observed in our analysis.

The final structure is within the statistical reliability level from the analyses performed. Table 6 shows the mean and standard deviations, Cronbach's alpha, and validity measures.

Table 6. Means (M), standard deviations (SD), Cronbach's alpha (α), composite reliability (rhoC), and validity (AVE) measures

Construct*	M	SD	α	rhoC	AVE	IPN	IPC	SAD	MDI	DTS
IPN	6.124	1.098	0.566	0.822	0.697	**0.835**				
IPC	5.798	1.305	0.666	0.799	0.499	0.514	**0.707**			
SAD	6.089	1.069	0.852	0.900	0.693	0.486	0.692	**0.832**		
MDI	6.085	1.091	0.884	0.920	0.742	0.418	0.542	0.669	**0.862**	
DTS	5.973	1.095	0.907	0.930	0.727	0.222	0.222	0.332	0.456	**0.852**

***IPN**: Reduce Information Processing Needs; **IPC**: Improve Information Processing Capability; **SAD**: Strategically Align Digital Technology-Business; **MDI**: Manage Digital Technology Infrastructure; **DTS**: Digital Transformation Project Success

5.2 Structural model

For the estimation of the model structure, R2 and significance levels of the relation of the constructs were analyzed. The relation of the constructs was also evaluated using bootstrapping with 1000 resampling iterations. The bootstrapping results, including the mediation, are detailed in Table 7.

Table 7. Structural paths

Path	Parameter Estimates	Confidence Interval		p-value
IPN --> SAD	0.177	0.040	0.309	0.010
IPN --> MDI	0.190	-0.002	0.379	0.049
IPN --> DTS	0.050	-0.109	0.222	0.760
IPN --> SAD --> DTS	0.016	-0.022	0.080	0.472
IPN --> MDI --> DTS	0.081	-0.001	0.169	0.061
IPC --> SAD	0.601	0.503	0.708	<0.001
IPC --> MDI	0.444	0.313	0.580	<0.001
IPC --> DTS	-0.097	-0.257	0.060	0.964
IPC --> SAD --> DTS	0.053	-0.095	0.210	0.471
IPC --> MDI --> DTS	0.190	0.056	0.328	0.006
SAD --> DTS	0.089	-0.153	0.335	0.476
MDI --> DTS	0.428	0.141	0.678	0.001

Figure 2 presents the research model and results. The model explains 50.2% of the variance in SAD. The IPN ($\hat{\beta}$ = 0.177, p-value = 0.010) and IPC ($\hat{\beta}$ = 0.601, p-value < 0.001) are statistically significant to explain the SAD, thus confirming hypotheses H1c and H2c. The model explains 32.0% of the variance in MDI. The IPN ($\hat{\beta}$ = 0.190, p-value = 0.049) and IPC ($\hat{\beta}$ = 0.444, p-value < 0.001) are statistically significant to explain the MDI, thus confirming hypotheses H1a and H2a. The model explains 21.4% of the variance in DTS. The MDI ($\hat{\beta}$ = 0.428, p-value = 0.001) is statistically significant to explain the DTS, thus confirming hypothesis H4. However, IPC, IPN, and SAD has no statistical significance to explain the DTS, not confirming hypothesis H1b, H2b and H3.

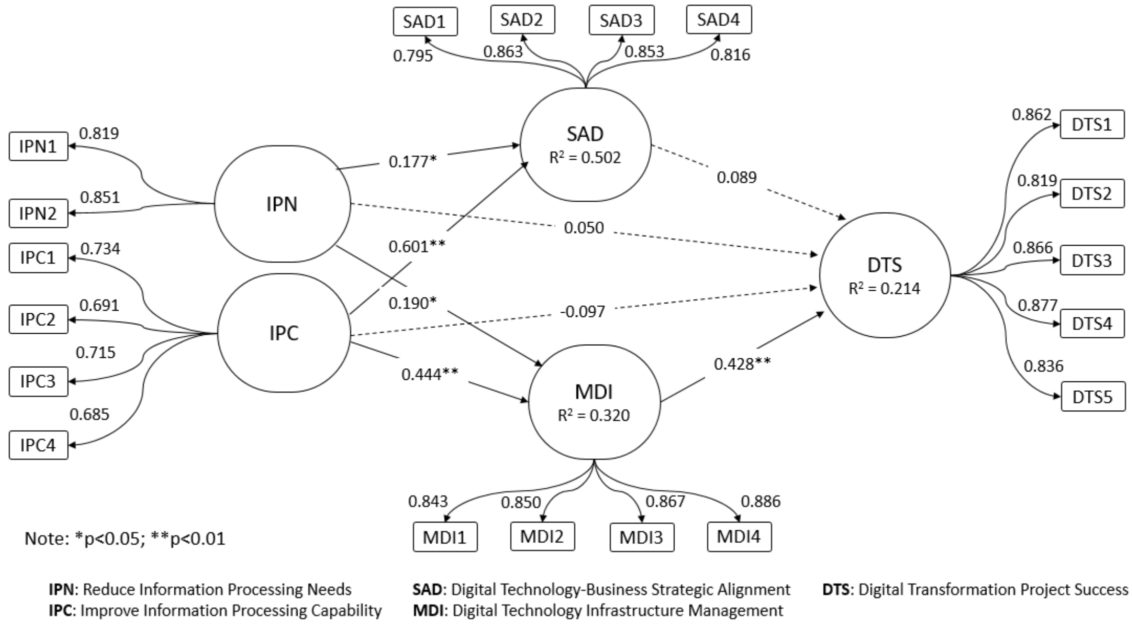

Figure 2. Research model and results

5.3 Mediation analysis

The fundamental attribute of a mediating effect, also known as an indirect effect or mediation, lies in its reliance on a third variable that acts as an intermediary in the connection between the independent and dependent variables (Nitzl, Roldan, & Cepeda, 2016). This work has examined the mediating effect of SAD and MDI over the relation between IPN and IPC. The mediation analysis is presented in Table 7. Based on the findings and the confidence interval, SAD is not a significant mediator, thus not confirming hypotheses H5a and H5b, as suggested by Hair Jr et al. (2021). However, MDI is significant mediator for IPC, supporting hypothesis H5d. Regarding the mediation with IPN, the confidence interval is close to the limit, and the p-value exceeds the 95% confidence threshold. Consequently, the results do not confirm the hypotheses H5c.

6. Conclusions

With the low level of success of DT projects (Ramesh & Delen, 2021), our research focused on identifying organizational initiatives that can precede and decrease the complexity of these projects. With less complex projects, the greater the chance of achieving success. After an extensive literature review, several initiatives have been identified that have shown to be influential in the success of DT projects. These initiatives are based on organizational information processing theory (Galbraith, 1974), strategic alignment, and IST infrastructure management (Li et al., 2021).

To validate the research model, a survey was conducted. A total of 205 digital transformation professionals were surveyed with various academic backgrounds, years of experience, and business areas. The results obtained through PLS-SEM indicate that reducing the need for information processing and improving information processing capability influences aligning digital technologies with the business in organizational strategy and managing the digital technology infrastructure. Managing the digital technology infrastructure can explain the variation in the success DT projects.

This research provides valuable input for current and future organizational managers and DT project managers. According to our results, organizational initiatives can be conducted even before the start of DT projects, increasing the achievement of goals and benefits to organizations.

6.1 Theoretical and practical implications

This research contributes to the organizational information processing theory proposed by Galbraith (1974), by combining the concepts of strategic alignment and information technology infrastructure management, as presented in the work of Li et al. (2021), with the impacts on the success of DT projects from the stakeholders' perspective, as discussed by Atkinson (1999) and Iriarte and Bayona (2020). After conducting the PLS-SEM analysis, we obtained favorable results for our research question, confirming hypothesis H1a, H1c, H2a, H2c, H4, and H5d.

Our research model explains the relationship between reduced need for information processing, improved information processing capacity, and strategic alignment between digital technologies and the business. The model explains 50.2% of the variance in strategic alignment between digital technologies and business. The findings demonstrate the importance of reducing the need for information processing and improving information capacity and the influence of these aspects on aligning digital technologies with the business in organizational strategy. Our research model also explains the relationship between reducing the need for information processing, improving information processing capacity, and managing the digital technology infrastructure. The model explains 32% of the variance in digital technology infrastructure management. Our hypotheses related to reducing the need for information processing and improving information processing capacity are supported. The results of reduce need for information processing and improve information processing capacity are consistent with similar studies reported in the literature (Premkumar, Ramamurthy, & Saunders, 2005). The results of aligning technologies with the business in the organizational strategy and management of the digital technology infrastructure have consistent and superior results to similar studies reported in the literature (Li et al., 2021).

Raymond and Bergeron (2008) work evaluating project success from the perspective of meeting deadlines, meeting schedule, and meeting scope is widely applied in the literature. The work of Tam, Moura, Oliveira, and Varajão (2020) also assesses success using similar success criteria, as do other studies in the literature. In the area of IS, which covers DT projects, stakeholder satisfaction is indicated as an important criterion listed by other works (Atkinson, 1999; Iriarte & Bayona, 2020). The research model explains 21.4% of the variance in the success of DT projects. Our research model the evaluation of project success based on stakeholder satisfaction and achievement of benefits shows consistent relationship with the management of the digital technology infrastructure.

With the demonstration that digital technology infrastructure management has a high impact on the success of DT projects, executives and project managers must assess whether, in fact, the organizations have the characteristics to support the business needs before starting the project. Some examples are related to an IST infrastructure that is prepared to adapt to quick business changes (Li et al., 2021) and prepare for future challenges (Shenhar, Levy, & Dvir, 1997).

Reducing the need for information processing is not statistically confirmed as a direct influence on the success of DT projects; however, it influences strategic alignment involving digital technologies and management of the digital technology infrastructure. Some alternatives for managers may be reducing information that does not add value, creating self-contained units, and creating vertical IS (Fairbank, Labianca, Steensma, &

Metters, 2006; Galbraith, 1974). In Business Process Management (BPM), the step of business process transformation explores the process improvement, redesign, and reengineering methodologies, along with the tasks associated with construction, quality control, and introducing and evaluating new processes. (ABPMP, 2019). Reducing the need for information processing before the DT project directly impacts this stage of the BPM life cycle.

Strategic alignment involving digital technologies and the business directly impacts the vision, goals, and strategic initiatives. For example, when using the Balanced Scorecard with the four perspectives (financial, customer, internal business process, learning, and growth), with metrics that guide the company to success (Kaplan, 2009), it is necessary to include the exploration of digital technologies to add organizational value. The exploitation can come from the implementation of a digital strategy (Correani, De Massis, Frattini, Petruzzelli, & Natalicchio, 2020; Kretschmer & Khashabi, 2020) to innovations such as when performing the BPM lifecycle (Baiyere, Salmela, & Tapanainen, 2020).

6.2 Limitations and future research

The variables available in our research model certainly have more items that could be explored, either in the independent variables or even to analyze the success of DT projects. In future research, the model can be extended, including additional items of organizational initiatives that could influence the results of a DT project.

Another issue is related to the data collected. The sample for our study concentrated on South America. Future research could focus on enlarging the sample and evaluating differences and similarities of perspectives from different regions of a nation or even continents, such as Europe, North America, Asia, and Africa. Also, the target audience was professionals with experience in DT projects. The result of the respondents' profiles focused on professionals who participated in DT projects, most of them being from the tactical and operational levels. In future work, can be surveyed other executives, to have a more strategic perception of the impacts of these initiatives on the success of DT and the link to the success of the organization.

References

ABPMP. (2019). *BPM CBOK (Guide to the Business Process Management Body of Knowledge)* (4st ed.). US: Association of Business Process Management Professionals.

Albert, M., Balve, P., & Spang, K. (2017). Evaluation of project success: a structured literature review. *International Journal of Managing Projects in Business, 10*(4), 796-821. doi:10.1108/ijmpb-01-2017-0004

Atkinson, R. (1999). Project management: Cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. *International Journal of Project Management*, *17*(6), 337-342. doi:10.1016/s0263-7863(98)00069-6

Baccarini, D. (1999). The Logical Framework Method for Defining Project Success. *Project Management Journal*, *30*(4), 25-32. doi:10.1177/875697289903000405

Baiyere, A., Salmela, H., & Tapanainen, T. (2020). Digital transformation and the new logics of business process management. *European Journal of Information Systems, 29*(3), 238-259. doi:10.1080/0960085X.2020.1718007

Bensaou, M., & Venkatraman, N. (1995). Configurations of Interorganizational Relationships: A Comparison Between U.S. and Japanese Automakers. *Management Science*, *41*(9), 1471-1492. doi:10.1287/mnsc.41.9.1471

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly*, *37*(2), 471-482.

Chin, W. W. (2010). How to write up and report PLS analyses. In *Handbook of partial least squares: Concepts, methods and applications* (pp. 655-690): Springer.

Cooke-Davies, T. (2002). The “real” success factors on projects. *International Journal of Project Management, 20*(3), 185-190. doi:10.1016/S0263-7863(01)00067-9

Correani, A., De Massis, A., Frattini, F., Petruzzelli, A. M., & Natalicchio, A. (2020). Implementing a Digital Strategy: Learning from the experience of three digital transformation projects. *California management review, 62*(4), 37-56. doi:10.1177/0008125620934864

de Wit, A. (1988). Measurement of project success. *International Journal of Project Management, 6*(3), 164-170. doi:10.1016/0263-7863(88)90043-9

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60-95. doi:10.1287/isre.3.1.60

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems, 19*(4), 9-30. doi:10.1080/07421222.2003.11045748

DeLone, W. H., & McLean, E. R. (2016). Information systems success measurement. *Foundations and Trends® in Information Systems, 2*(1), 1-116. doi:10.1561/2900000005

Eden, R., Jones, A. B., Casey, V., & Draheim, M. (2019). Digital Transformation Requires Workforce Transformation. *MIS Quarterly Executive, 18*(1), 1-17. doi:10.17705/2msqe.00005

Fairbank, J. F., Labianca, G. J., Steensma, H. K., & Metters, R. (2006). Information Processing Design Choices, Strategy, and Risk Management Performance. *Journal of Management Information Systems, 23*(1), 293-319. doi:10.2753/MIS0742-1222230110

Fischer, M., Imgrund, F., Janiesch, C., & Winkelmann, A. (2020). Strategy archetypes for digital transformation: Defining meta objectives using business process management. *Information & management, 57*(5), 1-13. doi:10.1016/j.im.2019.103262

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1), 39-50. doi:10.1177/002224378101800104

Galbraith, J. R. (1974). Organization Design: An Information Processing View. *INFORMS Journal on Applied Analytics, 4*(3), 28-36. doi:10.1287/inte.4.3.28

Gliem, J. A., & Gliem, R. R. (2003, 2003). *Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales.* Paper presented at the Midwest Research to Practice Conference in Adult, Continuing, and Community Education, Ohio, EUA.

Guhr, N., Lebek, B., & Breitner, M. H. (2019). The impact of leadership on employees' intended information security behaviour: An examination of the full-range leadership theory. *Information Systems Journal, 29*(2), 340-362. doi:10.1111/isj.12202

Gwebu, K. L., Wang, J., & Hu, M. Y. (2020). Information security policy noncompliance: An integrative social influence model. *Information Systems Journal, 30*(2), 220-269. doi:10.1111/isj.12257

Hafseld, K. H. J., Hussein, B., & Rauzy, A. B. (2021). An attempt to understand complexity in a government digital transformation project. *International Journal of Information Systems and Project Management, 9*(3), 70-91. doi:10.12821/ijispm090304

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice, 19*(2), 139-152. doi:10.2753/MTP1069-6679190202

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) using R: A workbook*: Springer Nature.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In R. R. Sinkovics & P. N. Ghauri (Eds.), *New Challenges to International Marketing* (Vol. 20, pp. 277-319): Emerald Group Publishing Limited.

Holland, C. R., & Light, B. (1999). A Critical Success Factors Model for ERP Implementation. *IEEE Software, 16*(3), 30-36. doi:10.1109/52.765784

Iriarte, C., & Bayona, S. (2020). IT projects success factors: a literature review. *International Journal of Information Systems and Project Management, 8*(2), 49-78. doi:10.12821/ijispm080203

Jöhnk, J., Oesterle, S., Ollig, P., & Riedel, L.-N. (2020). *The Complexity of Digital Transformation-Conceptualizing Multiple Concurrent Initiatives.* Paper presented at the 15th International Conference on Wirtschaftsinformatik, Potsdam, Germany.

Kaplan, R. S. (2009). Conceptual Foundations of the Balanced Scorecard. In C. S. Chapman, A. G. Hopwood, & M. D. Shields (Eds.), *Handbooks of management accounting research* (Vol. 3, pp. 1253-1269): Elsevier.

Kearns, G. S., & Sabherwal, R. (2006). Strategic Alignment Between Business and Information Technology: A Knowledge-Based View of Behaviors, Outcome, and Consequences. *Journal of Management Information Systems, 23*(3), 129-162. doi:10.2753/MIS0742-1222230306

Kotarba, M. (2018). Digital Transformation of Business Models. *Foundations of Management, 10*(1), 123-142. doi:10.2478/fman-2018-0011

Kretschmer, T., & Khashabi, P. (2020). Digital Transformation and Organization Design: An Integrated Approach. *California management review, 62*(4), 86-104. doi:10.1177/0008125620940296

Li, H., Wu, Y., Cao, D., & Wang, Y. (2021). Organizational mindfulness towards digital transformation as a prerequisite of information processing capability to achieve market agility. *Journal of Business Research, 122*, 700-712. doi:10.1016/j.jbusres.2019.10.036

Lowry, P. B., Zhang, J., Wang, C., & Siponen, M. (2016). Why do adults engage in cyberbullying on social media? An integration of online disinhibition and deindividuation effects with the social structure and social learning model. *Information Systems Research, 27*(4), 962-986. doi:10.1287/isre.2016.0671

Mallak, L. A., Patzak, G. R., & Kurstedt Jr, H. A. (1991). Satisfying stakeholders for successful project management. *Computers & industrial engineering, 21*(1-4), 429-433.

Marquis, D. G., & Straight, D. M. (1965). *Organizational factors in project performance*. Paper presented at the Second Conference on Research Program Effectiveness, Washington, D.C.

Matt, C., Hess, T., & Benlian, A. (2015). Digital Transformation Strategies. *Business & Information Systems Engineering, 57*(5), 339-343. doi:10.1007/s12599-015-0401-5

Nadkarni, S., & Prügl, R. (2021). Digital transformation: a review, synthesis and opportunities for future research. *Management Review Quarterly, 71*(2), 233-341. doi:10.1007/s11301-020-00185-7

Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares path modeling. *Industrial Management & Data Systems, 116*(9), 1849-1864. doi:10.1108/IMDS-07-2015-0302

Ogbanufe, O., & Gerhart, N. (2020). The mediating influence of smartwatch identity on deep use and innovative individual performance. *Information Systems Journal, 30*(6), 977-1009. doi:10.1111/isj.12288

Osmundsen, K., Iden, J., & Bygstad, B. (2018). *Digital Transformation: Drivers, Success Factors, and Implications.* Paper presented at the Mediterranean Conference on Information Systems, Corfu, Greek.

Pankratz, O., & Basten, D. (2014). Ladder to success – Eliciting project managers' perceptions of IS project success criteria. *International Journal of Information Systems and Project Management, 2*(2), 5-24. doi:10.12821/ijispm020201

Parviainen, P., Tihinen, M., Kääriäinen, J., & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International Journal of Information Systems and Project Management, 5*(1), 63-77. doi:10.12821/ijispm050104

Pereira, J., Varajão, J., & Takagi, N. (2022). Evaluation of Information Systems Project Success – Insights from Practitioners. *Information Systems Management, 39*(2), 138-155. doi:10.1080/10580530.2021.1887982

Pesce, D., & Neirotti, P. (2023). The impact of IT–business strategic alignment on firm performance: The evolving role of IT in industries. *Information & management, 60*(5), 1-20. doi:10.1016/j.im.2023.103800

PMI. (2021). *A Guide to the Project Management Body of Knowledge: (PMBOK guide)* (7th ed.). Newtown Square, PA, US: Project Management Institute.

Premkumar, G., Ramamurthy, K., & Saunders, C. S. (2005). Information Processing View of Organizations: An Exploratory Examination of Fit in the Context of Interorganizational Relationships. *Journal of Management Information Systems, 22*(1), 257-294. doi:10.1080/07421222.2003.11045841

Ramesh, N., & Delen, D. (2021). Digital Transformation: How to Beat the 90% Failure Rate? *IEEE Engineering Management Review, 49*(3), 22-25. doi:10.1109/EMR.2021.3070139

Raymond, L., & Bergeron, F. (2008). Project management information systems: An empirical study of their impact on project managers and project success. *International Journal of Project Management, 26*(2), 213-220. doi:10.1016/j.ijproman.2007.06.002

Rigdon, E. E., Sarstedt, M., & Ringle, C. M. (2017). On comparing results from CB-SEM and PLS-SEM: Five perspectives and five recommendations. *Marketing: ZFP–Journal of Research and Management, 39*(3), 4-16. doi:10.15358/0344-1369-2017-3-4,

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). Editor's comments: a critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly, 36*(1), iii-xiv. doi:10.2307/41410402

San Cristóbal, J. R., Carral, L., Diaz, E., Fraguela, J. A., & Iglesias, G. (2018). Complexity and Project Management: A General Overview. *Complexity, 2018*, 4891286. doi:10.1155/2018/4891286

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy, 5*(1), 105-115. doi:10.1016/j.jfbs.2014.01.002

Shenhar, A., Dvir, D., Levy, O., & Maltz, A. (2001). Project Success: A Multidimensional Strategic Concept. *Long Range Planning, 34*(6), 699-725. doi:10.1016/S0024-6301(01)00097-8

Shenhar, A., Levy, O., & Dvir, D. (1997). Mapping the dimensions of project success. *Project Management Journal, 28*(2), 5-13.

Tabrizi, B., Lam, E., Girard, K., & Irvin, V. (2019). Digital transformation is not about technology. *Harvard Business Review, 13*(3), 1-6.

Takagi, N., & Varajão, J. (2020). *Success Management in Information Systems Projects – work-in-progress*. Paper presented at the Proceedings of the Portuguese Association for Information Systems Conference, Porto, Portugal.

Takagi, N., & Varajão, J. (2022). ISO 21500 and success management: an integrated model for project management. *International Journal of Quality & Reliability Management, 39*(2), 408-427. doi:10.1108/IJQRM-10-2020-0353

Takagi, N., Varajão, J., Ventura, T., Ubialli, D., & Silva, T. (2021). *Implementing Success Management and PRINCE2 in a BPM Public Project.* Paper presented at the Australasian Conference on Information Systems (ACIS), Sydney, Australia.

Tam, C., Moura, E. J. C., Oliveira, T., & Varajão, J. (2020). The factors influencing the success of on-going agile software development projects. *International Journal of Project Management, 38*(3), 165-176. doi:10.1016/j.ijproman.2020.02.001

Tarafdar, M., Maier, C., Laumer, S., & Weitzel, T. (2020). Explaining the link between technostress and technology addiction for social networking sites: A study of distraction as a coping behavior. *Information Systems Journal, 30*(1), 96-124. doi:10.1111/isj.12253

Thomas, G., & Fernández, W. (2008). Success in IT projects: A matter of definition? *International Journal of Project Management, 26*(7), 733-742. doi:10.1016/j.ijproman.2008.06.003

Tushman, M. L., & Nadler, D. A. (1978). Information Processing as an Integrating Concept in Organizational Design. *Academy of Management Review, 3*(3), 613-624. doi:10.5465/amr.1978.4305791

Wateridge, J. (1995). IT projects: a basis for success. *International Journal of Project Management, 13*(3), 169-172. doi:10.1016/0263-7863(95)00020-q

Wateridge, J. (1998). How can IS/IT projects be measured for success? *International Journal of Project Management, 16*(1), 59-63. doi:10.1016/S0263-7863(97)00022-7

Xiang, J. L., Archer, N., & Detlor, B. (2014). Business process redesign project success: the role of socio-technical theory. *Business Process Management Journal, 20*(5), 773-792. doi:10.1108/bpmj-10-2012-0112

Xu, X., Zhang, W., & Barkhi, R. (2010). IT infrastructure capabilities and IT project success: a development team perspective. *Information Technology and Management, 11*(3), 123-142. doi:10.1007/s10799-010-0072-3

Appendix

A1. The survey

Characterization of the Respondent

1. Gender

    Female

    Male

    Other/I don't want to identify

2. Age (years):

3. What is your main professional activity?

    Information Systems Technology (IST) manager

    Business manager (e.g., operations manager, financial manager)

    Programmer/Developer

    Systems analyst

    Project manager

    Professor/Researcher

    Other: ________________________

4. What was your initial major?

    Informatics/Computer Science

    Information Systems

    Business Administration/Management

    Other: _______________________

5. What is your highest academic degree?

    Secondary education

    Bachelor's degree

    Specialization/MBA

    Master's Degree

    Doctorate

    Other: _________________________

6. If you have any certification in project management or in any area of Information Systems Technology, please indicate below.

7. How many years’ experience does you have in digital transformation projects?

Less than 3

Between 3 and 5

Between 6 and 10

More than 10

8. What is the approximate number of digital transformation projects you have participated in?

Less than 3

Between 3 and 5

Between 6 and 10

More than 10

Characterization of the last digital transformation project in which you participated

To answer the questions in this section, please consider the organization of the last digital transformation project in which you participated.

1. In the last digital transformation project you took part in, which country was involved?

2. What is the number of employees in the organization where the project was carried out?

Less than 10

Between 10 and 50

Between 51 and 250

Between 251 and 500

More than 500

Don’t know / No answer

3. What is your company's annual turnover (in Euro)?

Less than 1,000,000

Between 1,000,000 and 10,000,000

Between 10,000,001 and 50,000,000

Between 50,000,001 and 100,000,000

More than 100,000,000

Don’t know / No answer

4. Which of the following best describes the organization’s main economic activity?

Agriculture, animal production, hunting, forestry and fishing

Extractive industries

Manufacturing

Electricity, gas, steam, hot and cold water and air conditioning

Construction

Wholesale and retail trade; repair of motor vehicles and motorcycles

Transportation and storage

Accommodation and food services

Financial and insurance activities

Real estate activities

Education

Human health and social support activities

Other: ______________________________

5. How much was the project budget (in Euro)?

Less than 50,000

50,001 to 10,000

100,001 to 250,000

250,001 to 500,000

More than 500,000

Don't know / No answer

6. How long did the project last?

Less than 6 months

Between 6 and 12 months

Between 13 and 24 months

Between 25 and 36 months

More than 36 months

7. Were third parties/external entities (e.g. consultants, suppliers, etc.) involved in the project implementation team?

Yes

No

If you answered "Yes" to the previous question, please indicate the types of third parties/external entities (e.g. consultants, suppliers, etc.).

Considering the experience of the last digital transformation project in which you participated

Please rate the importance of the following organizational initiatives for the success of the digital transformation project. Consider 1 unimportant and 7 of utmost importance.

1. Reduce the constraints (e.g., budget, human resources) of the functional areas to minimize the need for communication between organizational units.
2. Identifying and eliminating activities that do not add value to the business.
3. Creating self-sufficient processes (containing all the elements needed to be completed).
4. Formalizing language and concepts to improve the decision-making process.
5. Provision of technological tools to deal with high volumes of information in the context of decision-making.
6. Creation of temporary task forces to solve problems involving different areas of the business.
7. Creation of a liaison profile to be the interface between two or more interdependent departments in the event of significant communication needs.
8. Creation of a communication channel between IST managers and senior managers to reduce the flow of unnecessary information.
9. Promoting collaboration between IST managers and business managers in order to facilitate the exchange of information and knowledge.
10. Alignment between the IST area and business managers in the context of strategic decision-making.
11. A clear organizational vision of the strategic role of IST, increasing trust and reducing conflicts between the IST area and other areas of the business.
12. Provision of an IT infrastructure that adequately supports the information needs of the business.
13. Provision of an IT infrastructure that prepares the organization for future challenges.
14. Provision of a versatile IST infrastructure that can be quickly adapted when necessary.
15. Provision of an IST infrastructure that enables the proper integration of IST services throughout the organization.

Please, considering your experience in the last digital transformation project in which you participated, rate the success of the project

Consider 1 strongly disagree and 7 strongly agree.

1. The project was completed within the planned budget.
2. The project was completed on schedule.
3. The deliverables met the established quality criteria.
4. The client was satisfied with the results of the project.
5. The team/execution team was satisfied with the results of the project.
6. The users'/end users were satisfied with the results of the project.
7. The project achieved the planned organizational benefits.
8. The project result (product/service) was used by the client.

A2. Creating the model in R software

A2.1 The model, complete version

To create the theoretical model (Figure 1) and based on the evaluation item of each construct present in Table 1, the commands on R software are presented in the next. The names of the constructs have been abbreviated in the R code.

- “Reduce Information Processing Needs” to “InfoProcNeeds”;
- “Improve Information Processing Capability” to “InfoProcCapability”;
- “Strategically Align Digital Technology-Business” to “DtbSAlignment”;
- “Manage Digital Technology Infrastructure” to “DtInfraManagement”;
- “Digital Transformation Project Success” to “DTpSuccess”.

The R code using the SEMinR library to define the construct name and the link to the questionnaire items, the development of the theoretical model, and the link to the collected data are presented below.

```
# Defining the construct and items
measurements <- constructs(
  composite("InfoProcNeeds",        multi_items("IPN", 1:3)),
  composite("InfoProcCapability",   multi_items("IPC", 1:4)),
  composite("DtbSAlignment",        multi_items("SAD", 1:4)),
  composite("DtInfraManagement",        multi_items("MDI", 1:4)),
  composite("DTpSuccess",     multi_items("DTS", 1:8))
)

# Create multiple paths "from" and "to" sets of constructs
structure <- relationships(
  paths(from = c("InfoProcNeeds", "InfoProcCapability"), to =
"DtbSAlignment"),
  paths(from = c("InfoProcNeeds", "InfoProcCapability"), to =
"DtInfraManagement"),
  paths(from = c("InfoProcNeeds",
"InfoProcCapability","DtbSAlignment","DtInfraManagement"), to =
"DTpSuccess")
)

# Linking the structure to collected data "BD_TD"
pls_model <- estimate_pls(data = BD_TD,
                          measurement_model = measurements,
                          structural_model = structure)
```

The results of the model and reliability paths regarding all the items answered in the data collection are presented below, in the same format by the R software.

```
summary(pls_model)
```

```
Path Coefficients:
                   DtbSAlignment DtInfraManagement DTpSuccess
R^2                        0.502             0.319      0.189
AdjR^2                     0.497             0.312      0.173
InfoProcNeeds              0.177             0.190      0.027
InfoProcCapability         0.598             0.441     -0.064
DtbSAlignment                  .                 .      0.082
DtInfraManagement              .                 .      0.399

Reliability:
                   alpha  rhoC   AVE  rhoA
InfoProcNeeds      0.509 0.745 0.507 0.583
InfoProcCapability 0.666 0.799 0.499 0.667
DtbSAlignment      0.852 0.900 0.693 0.853
DtInfraManagement  0.884 0.920 0.742 0.887
DTpSuccess         0.904 0.918 0.589 0.950

Alpha, rhoC, and rhoA should exceed 0.7 while AVE should exceed 0.5
```

The loadings are presents the next.

```
summary(pls_model)$loadings

     InfoProcNeeds InfoProcCapability DtbSAlignment DtInfraManagement DTpSuccess
IPN1         0.462              0.000         0.000             0.000      0.000
IPN2         0.792              0.000         0.000             0.000      0.000
IPN3         0.824              0.000         0.000             0.000      0.000
IPC1         0.000              0.734         0.000             0.000      0.000
IPC2         0.000              0.690         0.000             0.000      0.000
IPC3         0.000              0.715         0.000             0.000      0.000
IPC4         0.000              0.687         0.000             0.000      0.000
SAD1         0.000              0.000         0.796             0.000      0.000
SAD2         0.000              0.000         0.863             0.000      0.000
SAD3         0.000              0.000         0.852             0.000      0.000
SAD4         0.000              0.000         0.816             0.000      0.000
MDI1         0.000              0.000         0.000             0.844      0.000
MDI2         0.000              0.000         0.000             0.850      0.000
MDI3         0.000              0.000         0.000             0.867      0.000
MDI4         0.000              0.000         0.000             0.886      0.000
DTS1         0.000              0.000         0.000             0.000      0.529
DTS2         0.000              0.000         0.000             0.000      0.573
DTS3         0.000              0.000         0.000             0.000      0.725
DTS4         0.000              0.000         0.000             0.000      0.877
DTS5         0.000              0.000         0.000             0.000      0.821
DTS6         0.000              0.000         0.000             0.000      0.857
DTS7         0.000              0.000         0.000             0.000      0.869
DTS8         0.000              0.000         0.000             0.000      0.804
```

Using the library SEMinR, we plotted the theoretical model generating the Figure 2.

```
plot(pls_model)
```

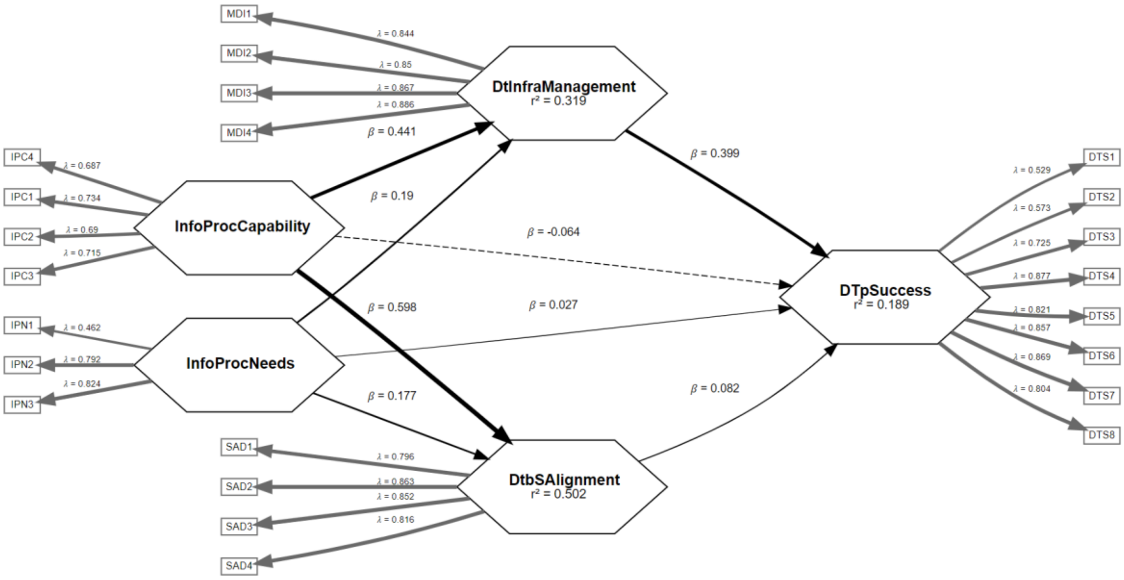

Figure 3. Theoretical model plotted by R software

The bootstrap procedure was used with 1000 resamples to obtain 95% confidence intervals around the parameter estimates. The R command and results are presented next.

```
boot_estimates <- bootstrap_model(pls_model, nboot = 1000, cores = 2,alpha
= 0.05)
summary(boot_estimates,alpha = 0.05)

Results from Bootstrap resamples:  1000

Bootstrapped Structural Paths:
                                          Original Est. Bootstrap Mean Bootstrap SD T Stat. 2.5% CI
InfoProcNeeds  ->  DtbSAlignment                  0.177          0.175        0.073   2.446   0.035
InfoProcNeeds  ->  DtInfraManagement              0.190          0.191        0.091   2.082   0.012
InfoProcNeeds  ->  DTpSuccess                     0.027          0.021        0.091   0.297  -0.154
InfoProcCapability  ->  DtbSAlignment             0.598          0.600        0.058  10.305   0.489
InfoProcCapability  ->  DtInfraManagement         0.441          0.441        0.068   6.440   0.308
InfoProcCapability  ->  DTpSuccess               -0.064         -0.069        0.101  -0.639  -0.268
DtbSAlignment  ->  DTpSuccess                     0.082          0.094        0.138   0.595  -0.168
DtInfraManagement  ->  DTpSuccess                 0.399          0.388        0.143   2.792   0.101
                                          97.5% CI
InfoProcNeeds  ->  DtbSAlignment              0.315
InfoProcNeeds  ->  DtInfraManagement          0.364
InfoProcNeeds  ->  DTpSuccess                 0.208
InfoProcCapability  ->  DtbSAlignment         0.706
InfoProcCapability  ->  DtInfraManagement     0.566
InfoProcCapability  ->  DTpSuccess            0.115
DtbSAlignment  ->  DTpSuccess                 0.363
DtInfraManagement  ->  DTpSuccess             0.641

Bootstrapped Weights:
                                Original Est. Bootstrap Mean Bootstrap SD T Stat. 2.5% CI 97.5% CI
IPN1  ->  InfoProcNeeds                 0.257          0.254        0.078   3.280   0.098    0.412
IPN2  ->  InfoProcNeeds                 0.519          0.512        0.066   7.894   0.377    0.631
IPN3  ->  InfoProcNeeds                 0.571          0.574        0.073   7.808   0.458    0.740
IPC1  ->  InfoProcCapability            0.370          0.374        0.039   9.413   0.301    0.459
IPC2  ->  InfoProcCapability            0.345          0.339        0.043   7.960   0.244    0.417
IPC3  ->  InfoProcCapability            0.355          0.356        0.041   8.701   0.281    0.441
IPC4  ->  InfoProcCapability            0.344          0.345        0.042   8.256   0.265    0.429
SAD1  ->  DtbSAlignment                 0.300          0.304        0.022  13.690   0.266    0.353
SAD2  ->  DtbSAlignment                 0.311          0.313        0.020  15.939   0.278    0.357
SAD3  ->  DtbSAlignment                 0.299          0.297        0.017  17.754   0.259    0.327
SAD4  ->  DtbSAlignment                 0.291          0.290        0.019  15.023   0.254    0.328
MDI1  ->  DtInfraManagement             0.304          0.303        0.023  13.311   0.262    0.351
MDI2  ->  DtInfraManagement             0.260          0.260        0.019  13.699   0.219    0.294
MDI3  ->  DtInfraManagement             0.288          0.290        0.019  15.102   0.262    0.334
MDI4  ->  DtInfraManagement             0.307          0.309        0.018  17.337   0.280    0.350
DTS1  ->  DTpSuccess                    0.050          0.051        0.051   0.976  -0.092    0.116
DTS2  ->  DTpSuccess                    0.058          0.058        0.055   1.042  -0.074    0.125
DTS3  ->  DTpSuccess                    0.114          0.113        0.039   2.899   0.012    0.166
DTS4  ->  DTpSuccess                    0.184          0.182        0.021   8.860   0.144    0.225
DTS5  ->  DTpSuccess                    0.163          0.154        0.044   3.661   0.035    0.219
DTS6  ->  DTpSuccess                    0.186          0.182        0.030   6.213   0.122    0.228
DTS7  ->  DTpSuccess                    0.234          0.236        0.043   5.424   0.179    0.352
DTS8  ->  DTpSuccess                    0.250          0.257        0.085   2.933   0.149    0.490

Bootstrapped Loadings:
                                Original Est. Bootstrap Mean Bootstrap SD T Stat. 2.5% CI 97.5% CI
IPN1  ->  InfoProcNeeds                 0.462          0.454        0.103   4.501   0.228    0.621
IPN2  ->  InfoProcNeeds                 0.792          0.782        0.061  13.069   0.646    0.869
```

```
IPN3  ->  InfoProcNeeds             0.824          0.824         0.044  18.812   0.724    0.900
IPC1  ->  InfoProcCapability        0.734          0.733         0.048  15.406   0.632    0.814
IPC2  ->  InfoProcCapability        0.690          0.679         0.076   9.080   0.503    0.801
IPC3  ->  InfoProcCapability        0.715          0.713         0.052  13.714   0.596    0.800
IPC4  ->  InfoProcCapability        0.687          0.687         0.059  11.730   0.555    0.782
SAD1  ->  DtbSAlignment             0.796          0.798         0.029  27.438   0.737    0.850
SAD2  ->  DtbSAlignment             0.863          0.861         0.024  36.245   0.808    0.902
SAD3  ->  DtbSAlignment             0.852          0.848         0.031  27.222   0.779    0.899
SAD4  ->  DtbSAlignment             0.816          0.814         0.031  26.199   0.747    0.867
MDI1  ->  DtInfraManagement         0.844          0.840         0.035  24.200   0.755    0.897
MDI2  ->  DtInfraManagement         0.850          0.848         0.040  21.200   0.758    0.910
MDI3  ->  DtInfraManagement         0.867          0.867         0.031  27.900   0.795    0.919
MDI4  ->  DtInfraManagement         0.886          0.883         0.025  34.917   0.827    0.923
DTS1  ->  DTpSuccess                0.529          0.520         0.111   4.770   0.237    0.663
DTS2  ->  DTpSuccess                0.573          0.565         0.110   5.229   0.280    0.695
DTS3  ->  DTpSuccess                0.725          0.711         0.090   8.026   0.472    0.816
DTS4  ->  DTpSuccess                0.877          0.862         0.059  14.798   0.715    0.922
DTS5  ->  DTpSuccess                0.821          0.802         0.074  11.117   0.610    0.880
DTS6  ->  DTpSuccess                0.857          0.841         0.058  14.812   0.722    0.904
DTS7  ->  DTpSuccess                0.869          0.861         0.036  24.259   0.792    0.906
DTS8  ->  DTpSuccess                0.804          0.798         0.054  14.995   0.669    0.885

Bootstrapped HTMT:
                                                 Original Est. Bootstrap Mean Bootstrap SD 2.5% CI 97.5% CI
InfoProcNeeds  ->  InfoProcCapability                    0.884          0.890        0.109   0.687    1.116
InfoProcNeeds  ->  DtbSAlignment                         0.725          0.718        0.115   0.481    0.937
InfoProcNeeds  ->  DtInfraManagement                     0.603          0.603        0.123   0.358    0.840
InfoProcNeeds  ->  DTpSuccess                            0.243          0.291        0.095   0.142    0.489
InfoProcCapability  ->  DtbSAlignment                    0.918          0.917        0.049   0.819    1.012
InfoProcCapability  ->  DtInfraManagement                0.705          0.703        0.076   0.542    0.839
InfoProcCapability  ->  DTpSuccess                       0.284          0.300        0.090   0.159    0.495
DtbSAlignment  ->  DtInfraManagement                     0.768          0.768        0.064   0.630    0.884
DtbSAlignment  ->  DTpSuccess                            0.325          0.322        0.097   0.159    0.519
DtInfraManagement  ->  DTpSuccess                        0.416          0.411        0.099   0.208    0.585

Bootstrapped Total Paths:
                                                 Original Est. Bootstrap Mean Bootstrap SD 2.5% CI 97.5% CI
InfoProcNeeds  ->  DtbSAlignment                         0.177          0.175        0.073   0.035    0.315
InfoProcNeeds  ->  DtInfraManagement                     0.190          0.191        0.091   0.012    0.364
InfoProcNeeds  ->  DTpSuccess                            0.117          0.111        0.096  -0.084    0.284
InfoProcCapability  ->  DtbSAlignment                    0.598          0.600        0.058   0.489    0.706
InfoProcCapability  ->  DtInfraManagement                0.441          0.441        0.068   0.308    0.566
InfoProcCapability  ->  DTpSuccess                       0.161          0.158        0.093  -0.047    0.322
DtbSAlignment  ->  DTpSuccess                            0.082          0.094        0.138  -0.168    0.363
DtInfraManagement  ->  DTpSuccess                        0.399          0.388        0.143   0.101    0.641
```

A2.2 Commands of the final model

The final model after evaluating the complete model results and removing some least significant items.

```
measurements2 <- constructs(
  composite("InfoProcNeeds",        multi_items("IPN", 2:3)),
  composite("InfoProcCapability",   multi_items("IPC", 1:4)),
  composite("DtbSAlignment",        multi_items("SAD", 1:4)),
  composite("DtInfraManagement",        multi_items("MDI", 1:4)),
  composite("DTpSuccess",     multi_items("DTS", 4:8))
)

# Create multiple paths "from" and "to" sets of constructs
structure2 <- relationships(
  paths(from = c("InfoProcNeeds", "InfoProcCapability"), to =
"DtbSAlignment"),
  paths(from = c("InfoProcNeeds", "InfoProcCapability"), to =
"DtInfraManagement"),
  paths(from = c("InfoProcNeeds",
"InfoProcCapability","DtbSAlignment","DtInfraManagement"), to =
"DTpSuccess")
)

pls_model2 <- estimate_pls(data = BD_TD,
                          measurement_model = measurements2,
                          structural_model = structure2)
summary(pls_model2)
Path Coefficients:
                   DtbSAlignment  DtInfraManagement  DTpSuccess
R^2                        0.502              0.320       0.214
AdjR^2                     0.497              0.313       0.198
InfoProcNeeds              0.177              0.190       0.050
InfoProcCapability         0.601              0.444      -0.097
```

```
DtbSAlignment                  .                 .      0.089
DtInfraManagement              .                 .      0.428

Reliability:
                   alpha  rhoC   AVE  rhoA
InfoProcNeeds      0.566 0.822 0.697 0.569
InfoProcCapability 0.666 0.799 0.499 0.667
DtbSAlignment      0.852 0.900 0.693 0.853
DtInfraManagement  0.884 0.920 0.742 0.887
DTpSuccess         0.907 0.930 0.727 0.922

Alpha, rhoC, and rhoA should exceed 0.7 while AVE should exceed 0.5
```