6-18-2022

EXAMINING THE ADOPTION OF ARTIFICIAL INTELLIGENCE FOR DIGITAL TRANSFORMATIONS

Mark Rowland
NUI Galway, m.rowland3@nuigalway.ie

Noel Carroll
NUI, Galway, noel.carroll@nuigalway.ie

Kieran Conboy
NUI Galway, kieran.conboy@nuigalway.ie

EXAMINING THE ADOPTION OF ARTIFICIAL INTELLIGENCE FOR DIGITAL TRANSFORMATION

Mark Rowland, National University of Ireland, Galway, m.rowland3@nuigalway.ie

Noel Carroll, National University of Ireland, Galway, noel.carroll@nuigalway.ie

Kieran Conboy, National University of Ireland, Galway, kieran.conboy@nuigalway.ie

Abstract

Digital transformation (DT) is considered to be a core priority for organisations and a strategy to strengthen their survival. With a myriad of new and evolving digital capabilities to initiate a DT process, it is often unclear how multi-stakeholders engage in exploring and exploiting new digital technologies and capabilities such as artificial intelligence (AI) during the early adoption phase. This study adopts the theory of organisational ambidexterity to examine how a higher education institution (HEI) adopted AI as part of its DT strategy. Our findings indicate that although multi-stakeholders set out with a shared high-level common vision, at an operational-level tensions emerge around defining DT and AI, realising value from AI, and determining their success. We identified how such tensions can both help or hinder a DT process in the early adoption process and we present recommendations to overcome these. We also present avenues for future research around AI in DT.

Keywords: Digital Transformation, Artificial Intelligence, Organisational Ambidexterity, Education, Exploration and Exploitation

1 Introduction

Over the past decade, digital transformation (DT) has been at the forefront of organisational leader's considerations across many sectors of industry (Huber et al. 2021; Carroll, 2020). DT can be described as a transformation from traditional business models or processes to digitized models through the utilisation of technology (Vial, 2019). DT is evident across a multitude of industries and many areas of our daily transactions and experiences (Rodgers, 2016). For example, retail and hospitality outlets deploy in-store automated self-service checkouts, algorithms determine the approval of loans and financial products in the financial sector and Zoom calls have replaced many traditional face to face meetings. In recent times, organisations set out to utilise advancements in technologies to create competitive advantage through DT which attempts to deviate from traditional modes of operating with the goal of improving processes, operations, customer interactions and creating a new improved business functionality (Marr, 2020). Prior to the events of the COVID-19 pandemic, a survey completed in 2019 (Tabrizi et al. 2019) identified DT as the prime concern for CEO's looking into 2020 and beyond. Furthermore, the survey also advised of the high failure levels of DT with an estimated $900 million wasted by organisations through DT projects. This would indicate the lack of knowledge and know-how around DT (Saldanha, 2019) which has been further exasperated by the COVID-19 global pandemic (Mueller and Lauterbach, 2021). COVID-19 has mandated the requirement for organisations to revise their current business strategies (Carroll and Conboy, 2020; Mueller and Lauterbach, 2021), owing to rigid governmental lockdowns and restrictions (Szlezak et al. 2020), organisations are seeking new business and operational models through digitisation (Leinwand and Mani, 2021). The divergence to digitised operational models has resulted in both challenges and opportunities for organisations transitioning to digital strategies with the goal of exploiting advancements in new technologies. Advancements, availability, and affordability (i.e., "the three A's") in new

technologies have given rise to rapid growth of cloud computing, internet of things, big data, and artificial intelligence (AI). Recent years, owing to the evolvement of three A's, have witnessed significant organisational investment in AI tools. AI can be described as a machines or system's ability to interpret and learn from data to apply the learnings to achieve specific goals and objectives (Kaplan and Haenlein, 2019). In many cases, AI goals and objectives can include improved decision-making (Shrestha et al. 2019), improved accuracy around predictions (Agrawal et al. 2018), and improved human engagement or experience. The motivation of this research is twofold. Firstly, a prime motivation for research is owing to the adoption and deployment of an AI chatbot in a higher education institution (HEI) environment being a novel concept, with a limited number of universities globally adopting this technology. Secondly, many AI deployments fail to reach anticipated objectives (Duan et al. 2019; Enholm et al. 2021). This case study presented a unique opportunity to undertake research in this evolving area of exploring AI as a tool for DT. This paper aims to contribute to the Information Systems (IS) field by documenting, analysing and enabling researchers to follow a HEI on its DT journey. This paper provides valuable insights into this journey which identifies stakeholders' viewpoints outlining the rationale for adopting, challenges, successes, and potential value creation in deploying an AI chatbot. This research also outlines future research for the IS community to build on in relation to DT and AI.

2 AI-led Digital Transformations

The evolution of AI achieving human-like intelligence is gradually transitioning to the realm of possibility (Marr, 2020). Furthermore, there is growing evidence that one critical element which often underpins the success or failure of DT is to improve the customer or end-user experience utilising tools such as AI (Iansiti and Lakhani, 2020). AI has indeed emerged as a principal tool of DT and is assisting organisations, improve, transform and the mode in which organisations operate (Rouhiainen, 2019). Additionally, it is estimated that in excess of 80% of large organisations implement some level of AI systems into business functions (Ghosh et al. 2019). With the arrival of COVID-19, which has impacted economies around the globe, this has placed a further reliability on AI and automation with the limitation of human resources (Coombs, 2020). In addition to the exponential growth of AI across industries, educational institutions are now exploring the use of AI with the goal of streamlining operations and there is significant growing evidence around its potential to improve processes and human engagement.

2.1 AI in Higher Educational Institutions

AI, despite its exponential growth across industries globally, has until recent times experienced significantly less traction across the higher education sector (Hashim et al. 2021). COVID-19 has shaken the education sector to its core. Higher education institutions (HEI), over the past number of years, have been tasked with the revision of strategies and transition to a digital mode of delivery; this has entailed both challenges and opportunities. For the purpose of this research, this paper focuses on AI and more specifically an AI chatbot deployment in a HEI. A chatbot can be described as a virtual agent with conversational capabilities with the ability to automate and provide information on a designed interface and platform (Lai et al. 2021; Valtolina et al. 2020). Furthermore, chatbots, through methods such as machine learning and natural language processing, possess the ability to mirror and mimic human intelligence, in the form of speech or text and are deployed to communicate with humans on platforms which include computers and smart devices (Ho et al. 2018; Chaix et al. 2019; Palanica et al. 2019). To assist with this research a literature review was carried out to gain insights into both AI and DT in a HEI context. In order to attain a comprehensive understanding of the topics, it is imperative to highlight and refer to existing research undertaken and literature. Research on the role of AI in DT is in its infancy, and as technologies evolve, there are growing opportunities to explore, conduct research and contribute to this fast paced rapidly evolving area. Owing to the nature of this unexplored space, AI in the education sector, locating literature in this specific field proved a challenge. Across the literature we identified a particular trend and pattern in that the education sector has lagged behind other sectors regarding DT. However, the COVID-19 global pandemic significantly changed this trend and, similar to other sectors, necessitated the education sector

seek new digitised strategies (Belsky, 2019). There are examples of HEI deployments of chatbots and other AI tools with universities such as Georgia Tech leading the way and deploying an AI teaching assistant (Gallagher and Palmer, 2020). With this form of AI adoption at a very early deployment stage, the literature review identified a significant lack of research in this area.

3 Problem Statement

Although DT and AI are described as a recent phenomenon that have come to the fore in the past decade, both have been occurring for a substantially longer period. Technology has been steadily advancing at an exponential rate, which has witnessed DT and AI deployments taking place significantly longer than the much-publicized rise of the digitised world (Dick, 2019; Carroll, 2021). Many organisations across a multitude of industries are increasing their investments in AI tools, which predicts investments to grow radically. However, although investment in AI continues to rise, there are many weak assumptions on how AI contributes to the success of DT. We summarise these as follows:

- **Defining AI and DT**: Research indicates there are many definitions of AI (Allen, 1998; Brachman, 2006) and DT (Vial, 2019). Within a DT and AI context, this raises a problem around the array of widely used and misused definitions of both DT and AI. Specifically, this can present challenges for seeking agreement among multi-stakeholders and whether this may lead to further issues such as realistic expectations. This lack of clarity or a shared agreed definition with stakeholders has the potential to create future challenges in deployment (Mikalef and Gupta, 2021).
- **AI and DT failure**: Many DT and AI deployments are reported as suffering from high failure rates (Tabrizi et al. 2019; Bucy et al. 2016). There is further research required to determine why DT and AI deployments fail to reach goals and objectives. This AI chatbot deployment case study provided a unique opportunity to identify what factors may lead to a successful or unsuccessful deployment.
- **Value realisation of AI**: There is some uncertainty around how the value of AI and DT is determined by an organisation (Canhoto and Clear 2020; Duan et al. 2019). This may be viewed as a monetary value such as a reduction in costs or an increase in revenue (Enholm et al. 2021; Al Sheibani et al. 2020). This may also be seen as improved operational efficiency, increased customer satisfaction or in the case of this case study, the HEI efforts to improve student engagement.
- **Planning for success with AI**: Within a DT context, more focus is required on determining success and how is it captured across organisations. Additional questions also need to focus on how success can be measured through analytics, key performance indicators (KPIs), and user feedback (Schrage et al. 2022).

AI has experienced exponential growth across industries in recent times (Iansiti and Lakhani, 2020) and has become a pertinent DT tool for organisations. Yet many of these AI deployments fail to reach their goals and objectives (Fountaine et al. 2019). There is significant evidence to signify a 'fear of missing out' with organisations deploying new technologies in the fear of losing competitive advantage (Wang, 2010). Competitive advantage and competitive strategies can be identified as differentiation and cost leadership (Porter, 1985). To address the issues outlined above, this research sets out to address the following research objectives: *to examine how multistakeholders engage in the adoption of AI as part of a DT strategy.*

4 Theoretical Lens: Organisational Ambidexterity

For the purpose of this research, organisational ambidexterity is adopted as a theoretical lens. Organisational ambidexterity may be described as an organisations ability to pursue both exploration and exploitation (Benner and Tushman, 2002; Gibson and Birkinshaw, 2004; Tushman and O'Reilly, 1996). The focus on exploration and exploitation can be utilised for technology implementation in an organisational context, making this theory relevant to this research within a DT context.

Exploration includes fundamental terms and characteristics such as discovery, experimentation, innovation, and risk taking whereas exploitation can refer to terms and characteristics which include refinement,

efficiency, and competencies (March, 1991). There is a belief that implementing organisational exploration and exploitation simultaneously is challenging and ultimately where one is chosen over the other, trade-offs are made, choices are sacrificed and unavoidable (Sinha, 2015). Reverting to the DT and AI implementation, the HEI in this case study faced this dilemma: to explore the realms of the digital unknown (i.e., the AI chatbot deployment) or utilise current existing internal technology resources. This can potentially be viewed as short-term versus long-term gains. If the organisations attempt to improve existing resources and efficiencies, exploitation (short-term), the question was: '*will there be an element of trading off the potential of long-term gains and benefits associated with AI chatbot deployment?*' This is further emphasised by Jan and Trimble (2011) who advise of an organisations' mandate to achieve efficiencies short-term and innovate for the long-term future. It is further advised to achieve a balance between exploration and exploitation (March,1991; Sinha, 2015). Figure 1 displays March's (1991) exploration and exploitation from a theoretical framework viewpoint. Figure 1 adds to March's (1991) work by proposing organisations view exploration and exploitation as cyclical process in a continuous loop, whereby an organisation seeks to achieve both simultaneously. The theoretical framework maps an organisations journey which commences on the emergence of an opportunity to create value from new or existing technology capabilities. Such technology is then explored and if implemented, it is exploited. Once exploited the technology will create new value and become embedded in the organisation. This cyclical journey ends when the technology has resulted in an organisational evolution owing to this new DT. In addition, it is advised that a balance between exploration and exploitation should be reached, and top management are critical to achieving this (Sinha, 2006; Raisch and Birkinshaw, 2008). Organisational ambidexterity focuses on an organisation's ability (through the efforts of organisational actors) to both explore and exploit which is attained through sequential and simultaneous ambidexterity (Simsek et al. 2009). Sequential ambidexterity looks to complete both exploration and exploitation at different timeframes where simultaneous ambidexterity sees an organisation both explore and exploit simultaneously. To implement simultaneous ambidexterity, this can be achieved through structural, domain and contextual ambidexterity (Gibson and Birkenshaw, 2004; Lavie et al. 2010). As part of this research, we present examples of the exploration and exploitation dilemma, challenges, fears, issues, potential successes, and failures are highlighted and flagged. The case study highlights how organisational exploration and exploitation takes place in a DT and AI project deployment.

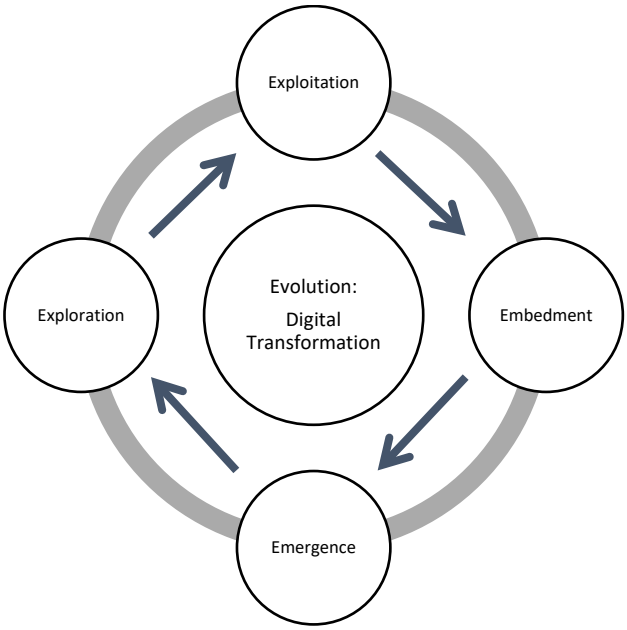

Figure 1: Exploration and Exploitation Theoretical Framework

5 Methodology

This study adopts deductive and qualitative research. Qualitative research can be described as research which excludes numbers, instead includes text, words, images, tends to begin with a broad question, can be smaller in size, ideally yields rich data and is explorative in nature (Saunders et al. 2012). A case study was undertaken to examine the deployment of an AI chatbot within a HEI. Data or information was gathered from a multitude of sources which include interviews, observation, files, documents, and participant observation (Yin, 1994). Eight in-depth semi-structured interviews were conducted with the goal of attaining insights into the adoption of AI for DT at the HEI. Semi-structured interviews provided a list of predetermined questions to assist the interviewee gain insights into a specific topic or area (Bell et al. 2015) but offered flexibility to probe into other topics further where appropriate. We were also provided with the opportunity to engage with the project through direct observation and ethnographic research techniques which assisted the researchers in identifying trends, challenges, and pain points by a multitude of stakeholders involved in the project. This method was a critical technique to provide the researchers with the ability to observe all areas of the project. This paper explores how multiple stakeholders involved in an AI project within the HEI sector evolved and evolved in practice. In doing so, we address the following research question: *What is the multistakeholder experience in adopting AI as a tool of DT within a HEI?* To address the research question, we documented how a HEI embarked on a DT and AI journey with the goal of creating value through improved operational efficiencies. We interviewed eight stakeholders (Table 1) to gain insights and identify where value will be attained through the utilisation of AI tools. The interviews were carried out utilising the Microsoft Teams platform as the preferred meeting tool. Each interview was transcribed, analysed, and coded to obtain accurate and relevant stakeholder viewpoints. The ability to engage in direct observation through ethnographic research was also possible owing to the online platform Microsoft Teams. This proved valuable as many of the stakeholder conflicts were observed during regular project meetings owing to this observation method. The stakeholder meetings were analysed with the objectives of identifying emerging patterns, trends, issues, or challenges. Longhand notes of each interview were also taken which assisted in reverting to vital interview observations and notes. This method of research proved extremely valuable as each stakeholder interview was recorded and could be referred to where necessary. It should also be noted, each HEI stakeholder contributed to the project equally inclusive of the HEI student representative. However, the HEI lead project manager was the project leader and key decision maker.

Stakeholder Code	Summary of Role
AiCEO	Partner/Supplier AI CEO
AiCTO	Partner/Supplier AI Chief Technology Officer
AiMktMgr	Partner Supplier Marketing Manager
UniMgr1	HEI Lead Project Manager
UniMgr2	HEI Project Manager
UniContMgr	HEI Content Manager
UniDirSS	HEI Student Services Director
UniStuRep	HEI Student Representative

Table 1. *Summary of Interviewee Profiles*

6 Summary of Findings

6.1 Defining Digital Transformation and AI

The findings support many of the challenges reported in literature around defining AI particularly within a DT context. Specifically, definitions of DT and AI had a variety of interpretations for stakeholders. One interviewee (AiCEO) described DT as an ongoing journey:

> *"Digital transformation at its core really is built on people's ability to leverage their existing investment in technology. We mean the journey because this is ongoing, I think, forever for most organisations.*

In addition, other interviewees described DT as an inevitable process which needs to be communicated from top down.

> *"I think it's an inevitable process, but I think the people involved in it at the bottom level, have to understand the benefits out of it. And I think, in most scenarios, the top management is usually committed to adopt digital transformation. But I think it's not communicated in a way to the people working at the bottom."* (AiCTO)

> *"Using technology to enhance experience and increase efficiency, reduce waste. Making things better for customers and staff."* (UniMgr1)

What resonated throughout was the multitude of interpretations, descriptions, and concepts of DT. The question of defining DT was consistent with the keywords of technology, journey, communication, efficiency, and improvement featuring prominently. This proved to be similar in the academic field, with Vial (2019) identifying twenty-three academic definitions in which scholars define DT. Our findings also indicate that there were many different perspectives on defining AI. For example, five interviewees defined AI as:

> *"Creating a knowledge base which students can access and gets smarter the more it is used. Train it and teach it to respond to first level enquiries with the potential to create a personalised experience for a student."* (UniMgr1)

> *"The utilisation of technology to improve a customer or end user experience."* (AiMktMgr)

> *"Utilising data/nuances common language to colour in the picture of the students. To provide an accurate picture of students' lives from start to finish. Identify students at risk."* (UniMgr2)

> *"How machines can learn from us: Automate systems and processes. The more they learn, more they can predict."* (AiMktMgr)

> *"AI is like a mirror of the data you have and how people interact. Only as good as your data. Data needs to be accurate. AI needs to understand. AI can assist with predictions."* (AiCEO)

This supports literature on AI which suggests that there is a lack of an accepted definition thus far (Bhatnagar et al. 2018). When stakeholders and participants were requested to define AI, this yielded a similar outcome. AI was described as "*machines learning*", "*improving lives*", "*an ability to automate and understand knowledge*", "*a method for risk detection*", "*a machine which can be trained*", and "*machines which have the ability to assist humans in the future*". Approximately 50% of interviewees identified data as a key element of AI. Two of the interviewees held the perception that machines will replace humans for certain tasks whilst another interviewee (UniDirSS) highlighted "*the accuracy of information provided by AI as to be potentially more accurate than human*". What was particularly evident across the interviewees was the general opinion of the potential of AI, which was included in the definitions, i.e., AI was viewed as something that will generate value in the future. This can be related back to March (1991) exploration and exploitation where there was a significant element of exploration as to what DT and AI encapsulates to project stakeholders. A lack of a clear definition led to challenges and tensions later in the project and potential to exploit digital capabilities. There is also a perception that AI will continue to evolve and have the capacity to learn and adapt as time goes on. With such a variation in defining DT and AI, this raises the

question: *If multiple stakeholders cannot agree on how to define DT and AI within a project, does this lend to inevitable challenges throughout the DT process?*

6.2 Success and Failure of AI in DT

DT projects in recent years have experienced significantly high failure rates (Carroll, 2020). There is a notable lack of research conducted as to why these projects are failing. March (1991) advises of the challenges of pursuing organisational exploitation and exploration simultaneously and suggests trade-offs occur. A balance or equilibrium should be sought. To assist with this balance, a structural ambidexterity perspective can be adopted identifying the creation of a new business unit to assist with both exploration and exploitation. On this instance this was achieved with a new business unit formed for the technology exploration and adoption allowing the organisation to continue to exploit and now, explore new avenues of innovation.

The AI chatbot project deployment in this case study provided a unique opportunity to witness and observe an AI DT project from early stages to adoption to deployment. This provided a unique opportunity to gain substantial insights into the project: specifically, rationale for adopting, challenges, pain points and lessons learned between stakeholders from each organisation (HEI and AI Partner). The ability to witness, observe and document the project was critical to identifying where successes or failures occurred. To attain a clear picture of what success entailed it was salient to understand the rationale for adopting AI (i.e., the chatbot) as a tool of DT.

All stakeholders delivered a consistent message. The deployment of an AI chatbot (on the institutional website) would assist or deal with issues relating to repetitive student queries at a faster rate and within a more efficient timeframe. Addressing these rising issues was highlighted by one stakeholder:

> *"The volume of enquiries was nearly at crisis level with repetitive questions being raised. This needed to be addressed" (UniConMgr).*

The chatbot functions twenty-four hours a day, three hundred and sixty-five days per annum, which could accommodate student queries at any time. The initial goal and objective for the chatbot was for it to become a *"first stop shop"* for student information, increase student engagement and improve operational efficiency by automating level one queries which was reverberated by stakeholders.

> *"The website is poor, and the FAQs are not up to date. There is huge potential for AI to assist with Level 1 queries". (UniStuRep)*

However, prior to the HEI proceeding with the project, the potential and possibilities of what an AI chatbot could become was a dominant factor stressed by the AI partner and HEI stakeholders alike in the adoption of the chatbot. It was advised as the chatbot continues to respond to queries, the chatbot can learn from this 'question and answer' data. In addition to analysing and processing real time live data, the chatbot had the ability to feed into other databases across the HEI and identify patterns and trends which occurred. For example, a student may repetitively query assistance for fees. This has the potential to flag this information with the relevant staff member to contact the student. Furthermore, there is the potential for personalisation, where the chatbot can become a personal assistant as such and advise of upcoming appointments, classes, exams, books due to be returned to the library and scheduled student events. This would be possible owing to the integration and connectivity to relevant databases (such as the library and the student union). This lack of connectivity was highlighted by a stakeholder (UniMgr2) who advised of the issues with siloed information and the chatbot has the potential to link all the HEI information together:

> *"The college is siloed and a lack of communication. The chatbot is a great tool to pull the communication pieces together and be a virtual first stop shop for information for students."*

A central HEI stakeholder highlighted the student journey and how the chatbot would assist with student wellbeing and wellness. The informative learning process with the chatbot was another fundamental area identified; the ability to obtain analytics on the queries students have and the ability to transition this to data was a significant challenge. Lastly, a significant rationale highlighted the reduction of risk for the HEI and

students alike. The HEI, through the ability to improve student retention and the reduction of risk to students indicated that the chatbot can improve a student's wellbeing and experience. Here is further evidence to highlight exploration and exploitation. The implementation of the advanced AI chatbot would entail new avenues of exploitation becoming available to the organisation through new knowledge streams from the insights gained. However, several factors influenced the project negatively. Firstly, a theme echoed by both parties, the HEI and partner, was the timeline for deployment: a three-month period was deemed sufficient time commencing the project. However, this was according to stakeholders from both groups, acknowledged to be an explicitly short timeframe for deployment and thus caused considerable tension between both parties. One stakeholder (UniContMgr) commented:

> *"Expectations from supplier from both HEI and partner and getting correct answers to questions (Data). Much needed in-house cleaning up of data and the timing (timeframe) could have been better. The bot can only be as good as put into it."*

Secondly, a theme which was stressed by all partner stakeholders, advised of overly high expectations as to a chatbot capabilities. One such stakeholder identified the media hype surrounding AI and its potential as a salient factor. This seemed evident across interviews with stakeholders from both parties echoing this frustration:

> *"There was technical pain with misalignment of expectations vs capabilities of suppliers. Now there is alignment there and steps put in place. Implementing change in the future may be perceived as a threat by some people of job loss and this will take time" (UniMgr2).*

From the HEI viewpoint, there was a perception of an intelligent chatbot with "*out of the box*" knowledge and functionality. From a supplier perspective, a repetitive message was reverberated outlining an AI and chatbot functionality and the reliance on data:

> *"The chatbot is only as good as the data provided (AiCEO)".*

There is a necessity for data to be clean and accurate to enable a high accuracy chatbot response level. The pre-work to be undertaken prior to commencing the project became an issue and essentially the responsibility fell on the AI partner/supplier to have communicated this early in the deployment which in turn may have eliminated future tensions. Thirdly, an additional factor was the lack of appropriate skillsets for an AI deployment. Beck et al. (2019) advises of the typical skillsets and resources required for an AI deployment which include an AI engineer, an AI data guru, a business leader, and AI translator. Although the partner supplied these resources the HEI lacked this level of expertise in the newly formed business unit. Fourthly, the project, for both partner and HEI, was a novel and pilot deployment. For the partner, it was a first to work in the education sector and this was evident when conducting interviews with many reports of a "*learn as you go approach*". This created significant tension throughout the project. For the HEI, this was a novel deployment, the first in the state, and although research had been carried out prior to the decision to deploy, it was also a learning curve and potential pitfalls were not identified. It should also be noted, and a vital point raised by one HEI stakeholder, the potential consequences of an unsuccessful project and deployment. An unsuccessful deployment being resultant in a lack of student engagement, no improvement in operation efficiency and a potential loss of revenue. The HEI stakeholder advised of the challenges of obtaining "*buy in*" from the HEI departments and decision makers in the future, and there may be the possibility that the project be "*shelved*" for many years.

6.4 Value Realisation with AI

Value for stakeholders were consistent with both the AI partner and HEI stakeholders alike. The move to a digital platform to communicate with end users (students) was highlighted by many as a necessity. There was a perception that the end user requires instant information at the touch of a button and a chatbot could provide this level of functionality. The chatbot was active all hours of the day, dealt with in excess of 10,000 queries simultaneously, provided instant level one information, and freed up administrative resources to tackle more complex issues. The wellbeing of the end users (students) was an essential factor for deployment identified by a multitude of HEI stakeholders alongside the chatbot's ability to provide

analytics which can detect critical trends and issues commonly raised by the end user (students) also resonated commonly. This was in the form of analytics provided for queries asked by the end user, for example, the ten most frequently asked questions by students. Furthermore, it was expected analytics would create value in identifying trends and patterns, specifically a student's well-being. The chatbot could identify a student struggling with a particular module, with fees, mental health, the ability to identify these issues for the student/end user may be invaluable. This was highlighted throughout with two stakeholders advising the value created by the chatbot:

> *"Can take a lead part in business strategy, identify potential students at risk and increase student retention which can lower the fallout rate and increase revenue."* (UniMgr2)

> *"Reduction of phone call and emails into all depts. May be able to assist in future development of the website and essential information. Chatbot has potential to pick up students in difficulties."* (UniContMgr)

Referring to exploration and exploitation theory, this can be viewed as a prime example enabling the HEI to exploit new information through the adoption of AI as a tool of DT which has the ability to create new opportunities and value. Value for the partner stakeholders was identified with all the above factors whilst also becoming a reference site in the educational sector providing reputational and potentially monetary value upon a successful deployment.

6.5 Planning for Success in AI

For both parties, the HEI and AI partner, success is a co-created process, and it was imperative the deployment was successful. Partner stakeholders indicated this could be measured by analytics and statistical metrics. Included in these metrics was graphical reports and a live dashboard of salient metrics and KPI's which were agreed with the HEI. This dashboard was accessible in real time and reports could be generated instantly on demand. The HEI also conducted research using questionnaires and surveys to capture students' feedback about the chatbot. For the chatbot to be successful for the HEI, that needed evidence in the form or metrics and analytics of increased student engagement, decrease in human administrative tasks, improved communication, and over time can improve student retention then the project was considered successful. This was highlighted by multiple stakeholders:

> *"Student engagement is a good indicator of success."* (UniStuRep)

> *"Ultimate success, would improve the KPI identified by the university and continuous improvement in student communication."* (UniDirSS)

> *"Whether or not it has improved efficiency, does technology save time? How many queries was the university previously getting and response times in comparison to after chatbot deployment?"* (AiCTO)

> *"Integrate reports into live reports on dashboard. Weekly reports provided with many metrics and engagement analytics."* (AiCEO)

Currently, given the nature of a HEI, it has proved challenging to place a monetary value on the chatbot deployment and the timeframe to research may be viewed as longer term wins than short term gains, for example improving student wellbeing. Student retention was reported as a prime metric with an expectation drop out levels decrease upon chatbot deployment. These metrics and insights will also be exploited (March, 1991) to create new innovative organisational processes and efficiencies.

7 Discussion

There were many lessons to be taken from this research with a salient lesson learned being that of the wide variety of definitions for both DT and AI. It was clear both concepts held a multitude of meanings to stakeholders. This raises doubt regarding the shared expectations between all parties involved in the AI deployment as part of a DT strategy. It would be wise for all stakeholders to agree on a definition for both terms at the early stage of the project. There were significant pain points experienced by both the HEI and

the AI partner alike. A fundamental challenge was the timeframe to deploy this chatbot which was approximately three months to implement a novel technology in the HEI. This was later acknowledged by stakeholders to be extremely optimistic with longer time spent on pre-works and structuring data. A critical lesson learned identified the need to better manage expectations from an early stage of the project as a pivotal factor to maintain stakeholder relationships. Value realisation from a HEI perspective entailed improving student engagement, improving student well-being, removing data silos, improving communications, analytics, the potential to identify trends and patterns, reduction in costs and improvement in efficiencies. Potential value for the AI partner, aside from a monetary value, would be valued as the reputable benefit of the chatbot deployment in the education sector, where AI chatbots are still viewed as in infancy in HEI's globally.

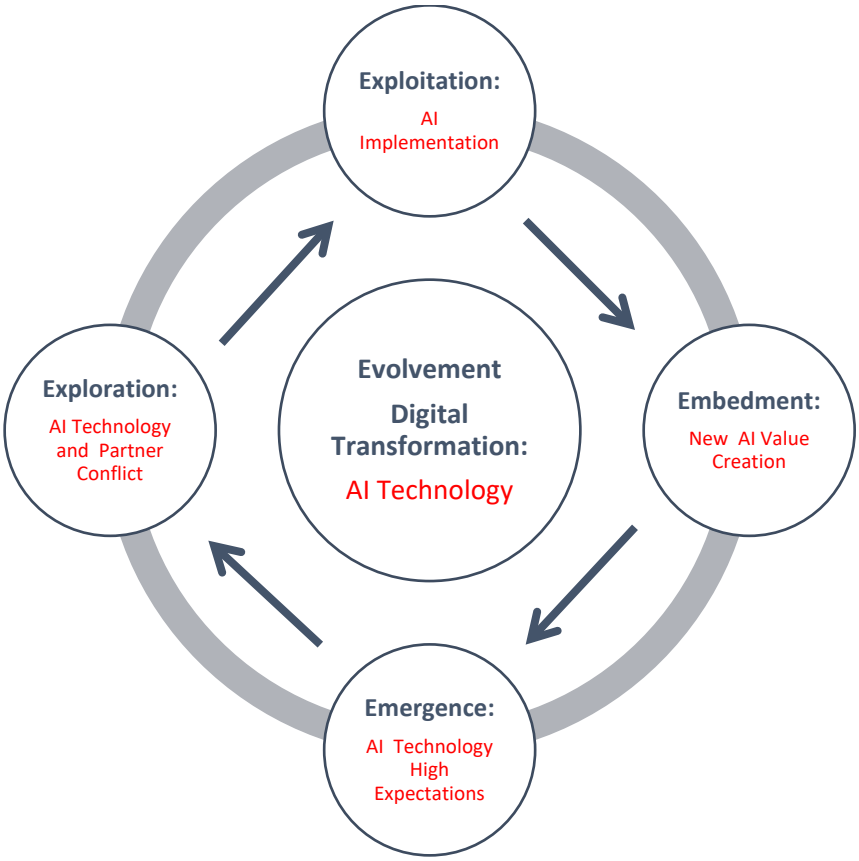

Figure 2: Exploration and Exploitation of AI for DT

As illustrated in Figure 2, the emergence of innovative technologies creates the opportunity to explore and then exploit this AI technology. Once exploited this technology creates new possibilities and value paths. The technology is then embedded into the organisation and leads to evolvement and transformation. This AI technology entailed high stakeholder expectations and in turn lead to conflict and tension demonstrated in the above exploration and exploitation theoretical derived from March's 1991 work. However, once tensions and conflicts were resolved this enabled the embedment of the AI technology and organisational evolvement through DT.

Problem	Recommendation
Defining AI	• All stakeholders must agree on a clear definition of AI. • From the definition, create awareness regarding the management of expectations as to digital capabilities.
AI and DT failure	• Identity potential pitfalls (e.g., timelines, expertise, and clean data). • Formulate an agreed roadmap for deployment between all stakeholders.
Value realisation AI	• Pre-empt potential silo bottlenecks with data. • Determine what value entails for stakeholders to align with the DT strategy.
Planning for success in AI.	• Allocate and employ expertise in the AI field. • Determine KPIs and metrics for success (i.e., identify what metrics will be utilised to determine success).

Table 2. Summary of key problems and recommendations of AI for DT

Table 2 summarises significant challenges identified during the adoption phase of AI for DT and presents some recommendations. From research undertaken during this case study, managing expectations as to potential digital capabilities were a significant cause of conflict, tension, and confidence in the adoption of modern technologies. If there was a threat of the HEI stakeholders potentially losing confidence in the AI deployment, it would have led to the real possibility of a reversal in deployment. This would have been easily avoided had communication between partner and HEI aligned in what AI encapsulated for both, what value encapsulated for both, expectations for both parties and finally a realistic timeframe for adoption.

Exploration and exploitation play a central role in organisational growth and sustainability for organisations. It is imperative an organisation can do both but finding a balance can create challenges. It was evident in the early adoption phase of the project the possible value exploration and exploitation can bring to an organisation. The adoption of AI can create new competencies and opportunities with the objective being value creation through innovation. March's (1991) through the novel theoretical framework lens can be utilised to assist and map this journey. The HEI adopted a simultaneous ambidexterity strategy creating a new business unit to focus on adoption and deployment. Members of this unit are managers from a multitude of areas within the organisation thus bringing insights from relevant areas. Furthermore, it falls on the members of this unit to act as communicators at an early adoption stage to ensure value is communicated effectively throughout the organisation. This was reported by several stakeholders regarding DT deployment and identified as the prime reason DT projects fail. Communicating expectations of AI and its potential also created challenges and conflict, and this may have been avoided. With so many DT projects failing to meet goals and objectives, exploration and exploitation from a theoretical perspective can assist organisations with a theoretical framework to adopt and how to navigate this uncertain period of transition.

8 Conclusion

The deployment of AI as a tool of DT is a new and unique challenge faced by organisations globally. Organisations seek to leverage innovative technologies with the goals of creating value and competitive advantage. This paper focused on a HEI's journey from early adoption to deployment of an AI chatbot and the challenges experienced along the way. As the HEI is an early adopter of this innovative technology, important lessons were learned and identified. The project ran into timeframe issues, managing expectations were a challenge and the issue of the project being a novel adoption and first for both HEI and partner (in the education sector) created conflict and tensions. However, the potential value of the implementation and deployment of the AI chatbot as a tool of DT outweighs the challenges experienced. Value was identified in many areas which include improved operational efficiencies, potential increased student engagement,

potential knowledge, and improved uniformed consistent student communication. The project has highlighted where future research should be undertaken and the potential value this research will contribute to this field. It is clear and expected after initial investment in infrastructure, there will be a return in investment over time identified as reduced administration costs as an example. However, is it possible to measure and monetize an increase in student/user engagement? Is it possible to measure retention rates owing to student engagement and wellbeing? There is further research required to identify how to measure these returns on engagement. Exploration and exploitation can be utilised as a prime theoretical lens and framework to assist with navigating and mapping an organisational journey through AI as a tool of DT. Further exploration and research into this space is necessary owing to the complexity of these disruptive technologies. As part of our future research, we will identify the perceived benefits and challenges of AI for digital transformation. In addition, we will identify how a deployed AI chatbot can be successfully measured and explore the use of analytics to guide AI-led digital transformations. There are also future research opportunities to explore the evolution of value creation through AI solutions and how the relationships associated with digital tools and engagement evolves over various timeframes, e.g., an analysis on the return-on-engagement and new theoretical developments associated with this.

Acknowledgements

This work was supported, in part, by Science Foundation Ireland grant 13/RC/2094 and co-funded under the European Regional Development Fund through the Southern & Eastern Regional Operational Programme to Lero - the Science Foundation Ireland Research Centre for Software (www.lero.ie).

References

Agrawal, A., Gans, J. and Goldfarb, A., (2018.) A simple tool to start making decisions with the help of AI. *Harvard Business Review*, pp.2-7.

Al Sheibani, S., Messom, C. and Cheung, Y., (2020), January. Re-thinking the competitive landscape of artificial intelligence. In Proceedings of the 53rd Hawaii international conference on system sciences.

Allen, J.F., 1998. AI growing up: The changes and opportunities. AI magazine, 19(4), pp.13-13.

Beck, M., Davenport, T.H. and Libert, B., (2019). The AI roles some companies forget to fill. Harvard Business Review, March, 14.

Belsky, L., (2019). Where online learning goes next. Harvard Business Review, pp.1-4.

Benner, M.J. and Tushman, M., (2002). Process management and technological innovation: A longitudinal study of the photography and paint industries. Administrative science quarterly, 47(4), pp.676-707.

Brachman, R. J. (2006). AI more than the sum of its parts. AI Magazine, 27(4), 19-19.

Bromley, D. B. (1990). Academic contributions to psychological counselling: I. A philosophy of science for the study of individual cases. Counselling Psychology Quarterly, 3(3), 299-307.

Bucy, M., Finlayson, A., Kelly, G. and Moye, C. (2016). The 'how' of transformation. McKinsey and Company.

Canhoto, A.I. and Clear, F., (2020). Artificial intelligence and machine learning as business tools: A framework for diagnosing value destruction potential. Business Horizons, 63(2), pp.183-193.

Carlsson-Szlezak, P., Swartz, P. and Reeves, M., (2020). Why the global economy is recovering faster than expected. Harvard Business Review, 11(03).

Carroll N and Conboy K. (2020). Normalising the "new normal": Changing tech-driven work practices under pandemic time pressure. International Journal of Information Management. 1;55, 102186.

Carroll, N. (2020). Theorizing on the Normalization of Digital Transformation. 28th European Conference on Information Systems (ECIS), Marrakech, Morocco, June 15-17.

Carroll, N. (2021). Augmented Intelligence: An Actor-Network Theory Perspective. Twenty-Ninth European Conference on Information Systems (ECIS 2021), Marrakesh, Morocco.

Chaix B, Bibault JE, Pienkowski A, Delamon G, Guillemassé A, Nectoux P, and Brouard B (2019) 'When chatbots meet patients: One-year prospective study of conversations between patients with breast cancer and a chatbot', Journal of Medical Internet Research, 21(5), pp. 1–7.

Coombs, C. (2020). Will COVID-19 be the tipping point for the Intelligent Automation of work? A review of the debate and implications for research. International Journal of Information Management, 55, Article 102182.

da Silva Souza, C.P. and Takahashi, A.R.W., (2019). Dynamic capabilities, organizational learning and ambidexterity in a higher education institution. The Learning Organization.

Dick, S. (2019). Artificial intelligence. URL: https://hdsr.mitpress.mit.edu/pub/0aytgrau/release/2 (visited on 10th October, 2021.)

Duan, Y., Edwards, J.S. and Dwivedi, Y.K., (2019). Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda. International Journal of Information Management, 48, pp.63-71.

Enholm, I.M., Papagiannidis, E., Mikalef, P. and Krogstie, J., (2021). Artificial intelligence and business value: A literature review. Information Systems Frontiers, pp.1-26.

Fountaine, T., McCarthy, B., and Saleh, T. (2019). Building the AI- powered organization. Harvard Business Review, 97(4), 62–73

Gallagher, S., and Palmer, J. (2020). The pandemic pushed universities online. The change was long overdue. Harvard Business Review, 29.

Ghosh, B., Daugherty, P. R., Wilson, H. J., and Burden, A. (2019). Taking a systems approach to adopting AI. Harvard Business Review May.

Gibson, C. B., and Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. The Academy of Management Journal, 47(2), 209–226.

Hashim, M. A., Tlemsani, I., and Matthews, R. (2021). Higher education strategy in digital transformation. Education and Information Technologies, 1-25.

Ho, A., Hancock, J. and Miner, A. S. (2018) 'Psychological, relational, and emotional effects of self-disclosure after conversations with a chatbot', Journal of Communication, 68(4), pp. 712–733.

Huber C., Sukharevsky A., and Zemmell R., (2021) 5 Questions Boards Should Be Asking About Digital Transformation. Url: https://hbr.org/2021/06/5-questions-boards-should-be-asking-about-digital-transformation (visited 24th September 2021)

Iansiti, M., and Lakhani, K. R. (2020). Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World. Brighton, MA: Harvard Business Press

Kaplan, A., and Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. Business Horizons, 62(1), 15–25.

Kolster, R., (2021). Structural ambidexterity in higher education: excellence education as a testing ground for educational innovations. European journal of higher education, 11(1), pp.64-81.

Lai, Y., Lioliou, E., and Panagiotopoulos, P., (2021) "Understanding Users' Switching Intention to AI-Powered Healthcare Chatbots". ECIS 2021 Research Papers. 51

Lavie, D., Stettner, U., and Tushman, M. L. (2010). Exploration and exploitation within and across organizations. Academy of Management Annals, 4(1), 109–155.

Leinwand, P., and Mani, M. M. (2021). Digitizing isn't the same as digital transformation. Harvard Business Review, 26

March, J. G. (1991). Exploration and exploitation in organisational learning. Organization Science, 2(1), 71–87.

Marr, B. (2020). The intelligence revolution: transforming your business with AI. Kogan Page Publishers.

Mikalef, P. and Gupta, M., (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational creativity and firm performance. Information and Management, 58(3), p.103434.

Mueller B. and Lauterbach J. (2021) How to Speed Up Your Digital Transformation. Url: https://hbr.org/2021/08/how-to-speed-up-your-digital-transformation (visited 24th September 2021)

Palanica A, Flaschner P, Thommandram A, Li M, Fossat Y (2019) 'Physicians' perceptions of chatbots in health care: Cross-sectional web-based survey', Journal of Medical Internet Research, 21(4), pp. 1–10.
Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance, New York
Raisch, S., and Birkinshaw, J. (2008). Organisational ambidexterity: Antecedents, outcomes, and moderators. Journal of Management, 34(3), 375-409
Rogers, D. (2016) The Digital Transformation Playbook. 1st edn. Columbia University Press.
Rouhiainen, L. (2019). How AI and data could personalize higher education. Harvard Business Review, 14.
Saldanha, T. (2019) Why Digital Transformations Fail. 1st edn. Berrett-Koehler Publishers.
Schrage M., Muttreja and V., Kwan A (2022) How the Wrong KPIs Doom Digital Transformation. MIT Sloan Management Review, Spring 2022
Shrestha, Y. R., Ben-Menahem, S. M. and von Krogh, G. (2019) 'Organizational Decision-Making Structures in the Age of Artificial Intelligence', California Management Review, 61(4), pp. 66–83.
Simsek, Z., Heavey, C., Veiga, J. F., and Souder, D. (2009). A typology for aligning organisational ambidexterity's conceptualizations, antecedents, and outcomes. Journal of Management Studies, 46(5), 864–894.
Sinha, S. (2015) 'The Exploration–Exploitation Dilemma: A Review in the Context of Managing Growth of New Ventures', Vikalpa, 40(3), pp. 313–323
Tabrizi, B., Lam, E., Girard, K. and Irvin, V. (2019). Digital transformation is not about technology. Harvard Business Review, 13.
Tushman, M. L., and O'Reilly, C. A. (1996). Ambidextrous organisations: Managing evolutionary and revolutionary change. California Management Review, 38(4), 8–30.
Valtolina, S., Barricelli, B. R. and Di Gaetano, S. (2020) 'Communicability of traditional interfaces VS chatbots in healthcare and smart home domains', Behaviour and Information Technology, 39(1), pp. 108–132.
Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems. 28(2), pp.118-14
Wang, P. (2010). Chasing the hottest IT: effects of information technology fashion on organizations. MIS quarterly, 63-85.
Yin, R. K. (1994). Case study research: Design and methods (2nd ed.). Newbury Park, CA: Sage Publications.