Influence of Digital Entrepreneurship and Entrepreneurial Orientation on Intention of Family Businesses to Adopt Artificial Intelligence: Examining Mediating Role of Business Innovativeness

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Abstract:

Purpose – This study aims to investigate the adoption intention of artificial intelligence (AI) in family businesses through the perspectives of digital entrepreneurship and entrepreneurship orientation.

Design/methodology/approach – The study examines contributing factors explaining the adoption intention of AI in the context of family businesses. The developed research model is examined and validated using structural equation modelling based on 631 respondents' data. Purposeful sampling is used to collect the respondents' data.

Findings – The proposed model included two endogenous (i.e., business innovativeness and adoption intention) and six exogenous variables (i.e., affordances, culture & flexible design, entrepreneurial orientation, generativity, openness, and technology orientation) through 10 direct paths and 3 indirect paths. The results depicted significant influence of all the exogenous variables on the endogenous variable reflecting support of all the hypotheses. The business innovativeness partially mediates the relationships of culture and flexible design, entrepreneurial orientation, and technology orientation with adoption intention. Further, the results demonstrated a model variance of 24.6% for business innovativeness and 64.2% for adoption intention of artificial intelligence in the family business.

Research limitations/implications – The study contributes to theoretical developments in entrepreneurship and family business research, AI's theoretical progress, especially to digital entrepreneurship.

Originality/value – Theoretically, it contributes to the literature of entrepreneurship, particularly digital entrepreneurship. Additionally, our research model adds to the role of entrepreneurial orientation and digital entrepreneurship in the emerging family entrepreneurship literature. Considering the scarcity of research in this field, the empirically

validated model explaining critical antecedents of AI adoption intention in the family business is a foundation for discussion, critique and future research.

Keywords Family business, Digital entrepreneurship, Entrepreneurial orientation, Artificial Intelligence, Technology adoption, Business innovativeness

Paper type Research paper

1. Introduction

Growth in the digital economy is disrupting all sorts of businesses, and for them to stay relevant in the market, they need to be more perceptive and agile (PwC, 2019). In the digital economy, all kinds of businesses are witnessing several strategic, financial and operational implications due to technological innovations and digital transformations (Ali, Balta, and Papadopoulos, 2022; Kitsios and Kamariotou, 2022; Kraus, Roig-Tierno, and Bouncken, 2019; Kraus et al., 2021; Nambisan, Wright, and Feldman, 2019; Olanrewaju et al., 2020). Even the most significant global businesses have now entered the digital economy space, leaving aside the functioning of the core industrial sector (Sebastian et al. 2017; KPMG, 2017). Businesses are finding ways to innovate the products or services continuously (Malik et al., 2021). In addition, businesses are redefining consumer value creation and decision-making by embracing various digital technologies (Upadhyay, Upadhyay and Dwivedi, 2021). Emerging technologies such as artificial intelligence, cloud, the Internet of things, and big data are now being appreciated by businesses worldwide (European Commission, 2017) that help them to (re)shape (traditional) businesses, strategies, operations, and models (Hradecky, Kennell, Cai, & Davidson, 2022; Bag et al., 2021). However, various regulatory, operational and technological changes affect business growth and competitiveness (PwC, 2019). Amidst all changes within and across the borders, family businesses remain attractive to the market segment. Surprisingly, despite family businesses dominating the economic landscape, accounting for two-thirds of the

business worldwide, there is a scarcity of research on family business contributions in the digital space. Moreover, these businesses generate annual GDP of 70-90 per cent and provide 50-60 per cent of jobs in most countries worldwide (Family Firm Institute, 2017).

As per the KPMG (2017) report, two out of three top concerns of family businesses are digitalization and innovation. Emerging economies in the last few years have experienced a diffusion of digital technology and services in non-family and family businesses (Family Firm Institute 2017). Additionally, research demonstrates family businesses' high economic and financial performance than non-family businesses (PWC, 2019). According to World Bank's Global Economic Prospects report (WB, 2019), India is considered the fastest-growing major emerging economy globally. In India, the growth in the family businesses towards the digital economy continues to grow. Moreover, family businesses thrive to remain competitive and aspire to contribute to India's economic resurgence in the digital economy. Indian family businesses contribute in terms of performance and numbers to the economy (Kean, John and Gomez, 2021). According to the McKinsey report, family businesses with a dominating figure of more than 60% in the Indian companies landscape have revenue of more than $1 Billion (Bjornberg, Elstrodt and Pandit, 2014).

The opportunity space of AI in disruptive businesses at all levels including operational, strategic contributing to competitive advantage and enhanced performances are immense (Borges, Laurindo, Spínola, Gonçalves, and Mattos, 2021; Dwivedi et al., 2021; Johnson, Albizri, Harfouche, and Fosso-Wamba, 2022; Werle and Laumer, 2022). Scholars argue that AI dominance is evident in shaping the businesses and marketplace (Makridakis, 2017). Prior research reports (for example, KPMG, 2017) that emerging technologies offer both opportunities and challenges to businesses. However, family businesses tend to differ in response to entrepreneurial opportunities and challenges compared with non-family businesses

(Konig, Kammerlander and Enders, 2013). Moreover, new opportunities for developing entrepreneurial ventures, activities and pursuits in the digital entrepreneurship space can be explored (Giones and Brem, 2017; Nambisan, Wright and Feldman, 2019). Therefore, family businesses must improve their entrepreneurial orientation to sustain themselves and compete in the fiercely competitive environment and rapidly changing technological innovation landscape (Cenamor, Parida and Wincet, 2019). Moreover, emerging economies are pacing towards market-based policies (Boso, Story and Cadogan, 2013). However, businesses operating in such an environment face strategic, operational and financial turbulences (Ivanov and Sokolov, 2013).

Hughes (2018) argues that despite the potential benefits of emerging technologies (for example, AI) in businesses, businesses from emerging economies remain sceptical about their adoption, usage, and usefulness. Prior research address factors such as lack of commitment and support of top management, lack of business innovativeness, the poor orientation of technology, lack of conducive culture and flexible environment that may account for such scepticism (Akhtar et al., 2019; Duan, Edwards and Dwivedi, 2019). Previous studies argue on building a firm's innovativeness for strategizing capabilities including product expansion & diversity, design flexibility, customer satisfaction (Jantunen, Ellonen and Jhansson, 2012). Further, a firm's technological orientation enables them to attain technological advancements to offer effective services and products. Family businesses are contemplating adopting and exploiting new sources of competitive advantage by embracing emerging technological innovations (PwC, 2019).

However, there is a paucity of research in understanding how family businesses are carrying out digital transformations by exploring and embracing emerging technological innovations in the digital entrepreneurship space. Family business scholars have to explore and address the

digital transformational landscape of family businesses to unfold their development and growth levers. Scholars and practitioners argue that as compared to any other known technologies artificial intelligence surpasses all the outcome expectations and opportunities space (Makridakis, 2017). Even, family businesses witness market-fit viable and potent opportunities to explore and exploit AI (Marr and Ward, 2019). Family businesses to exploit it for their competitive advantage and develop a market leadership position have to explore vital factors to adopt and use AI. However, there is a paucity of research in the family business to explore and exploit AI (Basly and Hammouda, 2020). As such, novel theorizing on the adoption of AI in the family business is indeed required (Nambisan Wright and Feldman, 2019; Sussan and Acs, 2017).

Organizations benefit from strategic connections, collaborations, and collective intelligence in driving entrepreneurial activities and projects by adopting and deploying novel digital technologies (Anderson, 2014). Besides, technological adoption alters the digital entrepreneurship space's organizational business processes, operations, offerings, and business models. Zaki (2019) observes manifestation and organizational transformations (for example, outside-in) through digital entrepreneurship. However, George and Marino (2011) and Baker and Sinkula (2009) argue that entrepreneurially-oriented organizations redefine industry configurations and organizational forms and initiate innovative projects to shape market offerings for their advantage at a faster pace. Dörner and Edelman (2015) argue that every business, including family firms, has to identify, explore and re-examine the way of doing business in the digital entrepreneurship space. Additionally, businesses need to understand the new and novel ways of capturing, generating, and delivering business values by leveraging digital technologies. Scholars and practitioners argue that AI provides novel opportunities to transform the marketplace and business and entrepreneurial activities (Le Dinh, Vu and Ayayi, 2018; Von Briel, Davidson and Recker, 2018; Verma et al., 2021). However, Kraus et al. (2019)

and Nambisan (2017) argue that little has been explored in identifying digital technologies' role in driving entrepreneurial ventures, activities, and pursuits in the extant research in entrepreneurship and family business. Additionally, though AI's digital entrepreneurship is vital in undertaking and operationalizing entrepreneurial pursuits and ventures, family firms are still contemplating emerging technologies adoption and usage (PwC, 2019). As such, the major objective of the research is to examine the role that entrepreneurial orientation and digital entrepreneurship play for the family business in adopting AI. Although there are multiple technology adoption models, many factors drive the adoption of technology. Therefore, it is paramount to unfold driving factors related to AI adoption in the family business by developing a novel theoretical adoption intention model, Family Business Artificial Intelligence (FBAI), explaining the adoption intention of AI in the family business. We consider two important theoretical perspectives - digital entrepreneurship, and entrepreneurial orientation to examine the adoption intention of family businesses towards AI. Therefore, the article intends to answer the following research questions:

- What factors determine adoption intention of artificial intelligence in the family business?
- To what extent entrepreneurial orientation and digital entrepreneurship explain family business adoption intention of AI?

We first describe the vital factors and contributing model that explains the adoption intention of AI in family businesses. Then we empirically test and validate the model based on the respondents' data from the Indian family businesses. To the best of our knowledge, the present research is the first to throw light on the adoption intention of artificial intelligence in the context of family businesses. We propose advancements in AI theoretical progress (Dwivedi

et al., 2021; Upadhyay, Upadhyay and Dwivedi, 2021), specifically in the family business, through the perspectives of entrepreneurial orientation and digital entrepreneurship.

We, therefore, propose several contributions in the domain of family businesses and digital entrepreneurship. First, we explore the digital entrepreneurship and artificial intelligence intersection. Second, we gather and examine vital factors explaining the adoption intention of AI in family businesses. Thirdly, we contribute to examining digital entrepreneurship, entrepreneurial orientation, technology orientation, business innovativeness and culture & flexible design in family businesses. Finally, we develop insights and a valuable stream of research in response to the call by Nambisan, Wright and Feldman (2019) and Basly and Hammouda (2020).

The remainder of this paper is structured as follows: Section 2 provides theoretical background followed by hypotheses development. Next, Section 3 elaborates on the research methodology, followed by the results in Section 4. Next, Section 5 provides discussion on findings emerged from this research investigation covering theoretical implications, implications for practice, limitations and future research directions. Finally, conclusion in presented in Section 6.

2. Theoretical Background, Hypotheses Development and Research Model

2.1 Digital Entrepreneurship and Artificial Intelligence

Hughes (2017) and The Guardian (2017) mention that digital technology associated with products and services offerings include the digital element (software or hardware), application or content connecting people, machines and information. Moreover, by attaining information decoupling in physical products, growth in digital services is evident (Islam et al., 2020). Anderson (2014) observe entrepreneurial activities and projects benefitting from the diffusion of digital technologies providing connection, collaboration and collective intelligence

mechanisms. Organizations are altering their business processes, operations, offerings, and business models in the digital entrepreneurship space. However, existing research in entrepreneurship and family business lacks in exploring the role of digital technologies in entrepreneurial ventures, activities and pursuits (Kraus et al., 2019; Nambisan, 2017). Kraus et al. (2019) argue that research on digital entrepreneurship is scarce and still in the infancy stage. Soltanifar and Smailhodžić (2021) discuss the requirement of a digital entrepreneurial mindset to venture and explore new market opportunities in a digitized world. In our understanding, digital entrepreneurship focuses on leveraging digital technologies, tools or business models to explore and exploit entrepreneurial pursuits and opportunities. Digital entrepreneurship reshapes business and communication with emerging and disruptive technologies in the digital space (Rodrigues and Franco, 2021).

Digital entrepreneurship paves the way for organizations to unfold the opportunities, enable and transform entrepreneurial processes, operations, activities, pursuits and business models by leveraging digital technologies (Davidson and Vaast, 2010; Asghari and Gedeon, 2010). Markus and Loebecke (2013) observe attainment of substantial business value by exploring opportunities leveraging digital technologies. Digital entrepreneurship can manifest and transform organizations (for example, outside-in) by enabling new and robust business models and generating new and novel customer experiences (Zaki, 2019). Organizations have to evaluate, assess, explore and exploit the digital technologies for their appropriation and use (Zaki, 2019; Christensen, Raynor and McDonald, 2015). Investigating the family business intention of digital technologies is vital to understanding the digital entrepreneurship space.

Digital technologies impact all types of firms' business models, the value chain, processes and digital capabilities (Zaki, 2019; Gurbaxanin and Dunkle, 2019). Dörner and Edelman (2015) argue that every business, including family firms, have to identify, explore and re-examine the way of doing business and understand the new ways of capturing, generating and delivering

business values by leveraging digital technologies. Among many emerging and disruptive technologies, scholars and practitioners argue that AI is a ground-breaking technology having novel opportunities to transform the marketplace, business, and pursuing entrepreneurial activities (Le Dinh, Vu and Ayayi, 2018; Von Briel, Davidson and Recker, 2018; Verma et al., 2021). AI contribution in business and personal landscape is evident. For example, recommendations, voice assistants, face and biometric recognitions are well-known solutions. Additionally, AI's digital entrepreneurship is vital in undertaking and operationalizing entrepreneurial pursuits and ventures. Scholars discuss AI developments into two forms - symbolic AI and neural AI. Organizations leverage symbolic AI as a support system as it has simple rule-based intelligence encompassing symbols to trigger the learning process. Whole business logic rule-based thinking makes symbolic-AI systems more easily understandable and practicable. As such, symbolic-AI systems are heavily used to automate business processes. While neural-AI systems are based on self-learning processes to generate meaningful patterns where algorithms and data become vital. Organizations have to consider both business and technical perspectives to examine and consider AI for its appropriateness and use (Agrawal, Gans and Goldfarb, 2018). Lee et al. (2019) discuss the potential impact of AI in entrepreneurial pursuits in venture creation, exploration and exploitation phase. For example, AI contributes to expediting the data collection, sensing and analyzing markets, positioning and targeting the markets, and managing the entrepreneurial activities and engagements (Loebbecke and Picot, 2015). Even AI contributes to the organizations' strategic implications by transforming and (re)-creating (novel) business models. Loebbecke and Picot (2015) and Agrawal, Gans and Goldfarb (2018) observe AI influence on organizations business models at all levels by providing support, assistance and driving functionalities. While AI-driven functionality develops new and novel business models, AI-support and AI-assist functionality affects business model components and operational activities. Family businesses show interest

in AI appropriateness and use it to unlock the potential of business models and entrepreneurial pursuits (Lee et al., 2019).

2.2 Entrepreneurial Orientation

Entrepreneurial orientation enables firms to explore new market opportunities and venture into uncharted spaces (Boso, Story and Cadogan, 2013) via developing innovativeness, culture, capabilities, competitive aggressiveness, openness, and flexibility (Lumpkin and Dess, 1996). The firms' entrepreneurial orientation snowballs from the top management and needs the support of the firms' adequate use of resources (Engelen et al., 2015; Yadav, Kar and Kashiramka, 2021). It reflects a firm's ability to explore new markets operationalize opportunity-seeking behaviour that develops capabilities to offer new and novel products and services (Boso, Story and Cadogan, 2013; Dubey et al., 2020). Baker and Sinkula (2009) argue that entrepreneurially-oriented organizations can redefine industry configurations and organizational forms to shape market offerings for their advantage. George and Marino (2011) argue that entrepreneurially-oriented organizations are adept in risk-taking in exploring new opportunities. Kellermanns and Eddleston (2006) mention that family business entrepreneurial orientation is often rare though it's valuable. Parveen, Jaafar and Ainin (2016) consider EO vital for organizations competing in the digital space. EO acts as a supportive force to emerging technology adoption and adapts to the market dynamics, be ready to compete and develop a propensity to exhibit risk-taking behaviour and initiate innovative projects (Lumpkin and Dess, 1996). As an emerging and disruptive technology, artificial intelligence requires family firms to act entrepreneurially and accept uncertain outcomes (George and Marino, 2011; Parveen, Jaafar and Ainin, 2016). We argue that family firms influence the adoption of emerging technologies to shape business propositions when they are entrepreneurially oriented (George and Marino, 2011).

2.3 Construct mapping

Nambisan (2017) discuss the significance of openness, generativity and affordance factors for digital technologies to drive digital entrepreneurship. Digital technology openness determines participation, contribution and outcome levels for business value. Additionally, it identifies actors who can participate and contribute (level of access and processes) to attain the outcomes for innovation and business value (Rothwell et al., 1974). Another factor, the "affordance" of digital technology provides an actor with potential actions and possibilities in a specific context (Gibson, 1979). Finally, the digital technology's generativity factor offers to large unrelated and uncoordinated entities/actors possibilities of incorporating unprompted change (Turner and Fauconnier, 1997). As such, AI technology's factors such as affordances, generativity and openness are vital for the family business exploring adoption of AI technology.

Gurbaxani and Dunkle (2019) advise relooking at the organization's culture and workforce flexibility (Votto et al., 2021) to map the evolving digital business context with the organizations' vision and strategies. Additionally, digital entrepreneurship requires a transformation of cultural aspects to ensure flexibility, agility and openness for smooth functioning. Organizational culture reflects the groups and their manifestation around underlying technology. Chrisman, Chua and Litz (2003) mention that family firms are different and unique from non-family firms as the presence of family dynamics influences the culture and vision of the firms (Singal and Gerde, 2015, p. 12). The shared values of firms might violate the adoption of new technology. As such, Cooper (1994) advise firm's to examine their inertia when an organization's culture conflicts with the technology. Culture is manifested by Digital transformation considering the digital technological appropriateness for the organization is accountable for (re)defining business value chain, business models and engagements. Concerning the family business, Lambrechts et al. (2017) argue that culture and flexibility though they play a vital role in the adoption of digital technologies, have not been addressed appropriately, and the phenomenon is evident specifically in family small-and-medium-sized

enterprises (SMEs). Andriole and Stephen (2018) advises considering cultural values to reinvent business offering and support. López-Fernández et al. (2016) argue alongside a family business culture, technology orientation towards the digital technology for attaining desired business values and novelty in the offerings becoming paramount. For example, a firm's technology orientation describes its ability to recognize and adapt to emerging technologies that help develop improved and new products and services. Costa, Lages and Hortinha (2015) argue that firms that are strong in technology orientation perform well in the marketplace and can resolve issues about regulators, policies, clients and employees.

Further, Salojarvi et al. (2015) argue that firms that exhibit appropriate technology orientation can adapt to dynamic market changes and accumulate enormous knowledge for their sustained advantage. Alongside technology orientation, firms' business innovativeness help them to exploit resources develop new ideas by incorporating new and innovative technologies best practices for competitive advantage. Wang and Ahmed (2004) mention firm's innovativeness is the ability to be ready to embrace a shift from its current usage of technologies and practice to adopting new and novel technologies for venturing into a new marketplace or developing new products and services. Firm's that are innovative can (re)define and shape business models, processes and entrepreneurial pursuits. It contributes to the heterogeneity that affects the propensity to adopt new and emerging technologies and innovations family (Calabrò et al., 2018). As such, culture and flexibility, technology orientation and business innovativeness play a vital role in adopting AI technology in family businesses.

Table 1 presents the vital factors to developing the novel model for family business AI adoption intention.

Table 1. Factors for the family business AI adoption intention

Factors	Description	Theorizing space
Openness	It refers to technology's ability to support and facilitate actors' interaction, contribution, participation, operationalizing processes and specific outcomes. It implies actors who can participate, what and how they contribute to generate outcomes.	Theorizing Digital Entrepreneurship Openness theorizing (Rothwell et. al, 1974) AI and openness (Upadhyay, Upadhyay and Dwivedi, 2021)
Affordance	It depicts an object's potential possibilities and actions offered to the user in a specific context. It means that affordance arises from the contextual relationship of the user and object where a user observes potential allowable actions for achieving a goal.	Theorizing Digital Entrepreneurship Theorizing sociomaterial aspects (Faraj and Azad, 2012); Theorizing affordances (Gibson, 1979) (Leonardi, 2011) AI and affordances (Upadhyay, Upadhyay and Dwivedi, 2021)
Generativity	It depicts digital technology capability to actualizing changes considering involvement of large dissimilar and uncoordinated entities/actors	Theorizing Digital Entrepreneurship Theorizing generativity (Doanld, 1991);

		Theorizing conceptual integration (Turner and Fauconnier, 1997) AI and generativity (Upadhyay, Upadhyay and Dwivedi, 2021)
Entrepreneurial Orientation	"one that engages in product-market innovation, under- takes somewhat risky ventures and is first to come up with 'proactive' innovations, beating competitors to the punch" (p. 771)	Theorizing Eentrepreneurial Orientation (Miller, 1983)
Technology Orientation	It refers to the "organization's capability to recognize and adapt to new technologies".	(Gatignon and Xuereb, 1997).
Business innovativeness	It refers to the "organization's capabilities to explore and exploit new market opportunities by leveraging new technologies, policies and best practices for competitive advantage within the industry and globally"	(Seyfang and Smith 2007; Bamgbade et al., 2019)
Culture & Flexible Design	It refers to "social or normative glue that holds a firm together and that expresses the values or	

	social ideals and beliefs which firm's members come to share". Also, showcase ability of firm's to "adapt to changing demands and to allocate the work force to the varying requirements configuring shared values"	Theorizing Organization culture, Technology and flexible work (Cooper,1994; Bamgbade et al., 2019; Iivari, and Huisman, 2007; Dettmers et al. 2013; Smircich, 1983)

2.4 **Hypotheses Development**

2.4.1 Generativity

The digital technology generativity depicts its capability to actualize changes by involving large dissimilar and uncoordinated entities/actors (Doanld, 1991; Turner and Fauconnier, 1997). Organizations operationalize their creativity and entrepreneurial pursuits leveraging technology generativity (Zittrain, 2006, 2008). Lyytinen et al. (2017) discuss technology generativity considers digital artefacts, digital platforms, digital infrastructures, digital ecosystems attributing to digital transformation for value creation. AI generativity in application programming interfaces facilitates heterogeneous innovation cutting across multiple domains and interests. Organizations keen on building and utilizing AI-supported, assisted, and driven products and services need to examine its operational and strategic implications (Upadhyay, Upadhyay and Dwivedi, 2021). Additionally, several factors such as IP rights, data privacy, safety and security might affect AI generativity. As such, family businesses considering AI inclusion in business examine AI generativity at all levels. We argue that the generativity of AI is critical for family business intention to adopt it. Therefore, we posit the following hypothesis:

H1: Generativity of AI in digital entrepreneurship influences adoption intention of AI in the family business

2.4.2 Openness

Openness depicts technology's ability to support and facilitate actors' interaction, contribution, participation, operationalizing processes and specific outcomes. It implies actors who can participate, what and how they contribute to generate outcomes. Hughes (2017) and The Guardian (2017) mention that digital technology associated with products and services offers various ways via digital elements (software or hardware), application or content connecting people, machines and information to attain business value. Moreover, digital technology-enabled platforms (Tiwana, 2014) and technological ecosystems facilitate and support governance, collaboration, joint decision-making, and co-creation of values (Wareham et al., 2014). As such, the openness appropriateness of the technology enables firms to innovate by leveraging connection, collaboration and collective intelligence mechanisms (Anderson, 2014). Benlian, Hilkert and Hess (2015) argue that technology openness contributes to platform and business ecosystems innovation. Moreover, openness in technology's standards and interfaces facilitates value creation (Tiwana, 2014). AI's flexible and open application programming interfaces and standards facilitate firms to develop new and novel products and services; collaborate and co-create business values (Upadhyay, Upadhyay and Dwivedi, 2021). Considering family businesses, they all see the potential of AI openness in scale and degree to support, assist and drive family businesses. For example, family businesses can expand their reach and be more inclusive in decision-making and governance by leveraging AI openness. Therefore, we posit the following hypothesis:

H2: Openness of AI in digital entrepreneurship influences adoption intention of AI in the family business

2.4.3 Affordances

Affordance depicts an object's potential possibilities and actions offered to the user in a specific context. It means that affordance arises from the relationship between the user and object in a context where a user observes potential allowable actions for achieving a goal (Leonardi, 2011). Additionally, it does not deal with the state or action after actualizing an action rather, it focuses on the potential action (Strong et al., 2014). Affordances of systems and technology influence organizational, entrepreneurial pursuits. When observing a great level of affordance from a particular technology, organizations get involved in developing and rolling new and novel products and services (Strong et al., 2014). Affordance becomes a vital factor in technology adoption (Faraj and Azad, 2012). Usage of similar digital artefacts, platforms, or infrastructure does not generate similar outcomes. However, using such in a specific context can generate, capture and deliver values (Nambisan, 2017; Nambisan, Wright and Feldman, 2019). The digital technologies show affordance via their synergetic features and functions to support products and services. As AI is used to support, assist and drive businesses, its affordance understanding is essential to examine and explore potential actions. Emerging technologies such as AI shape, establish, and strengthen, relationships among objects and entities in a use context. Therefore, we posit the following hypothesis:

H3: Affordances of AI in digital entrepreneurship influences adoption intention of AI in the family business

2.4.4 Technology Orientation

Technology orientation refers to the organization's capability to recognize and adapt to emerging technologies. Gatignon and Xuereb (1997) argue that technology-oriented firms exhibit a strong tendency to be ready to experiment with new technologies and develop new products. Family businesses with technology orientation prioritize new technologies in shaping and developing business offerings. Costa, Lages and Hortinha (2015) argue that technology-oriented firms can resolve issues related to technology, regulators and legal concerns and client.

Concerning family business, we argue that technology orientation towards artificial intelligence to explore and exploit it in supporting, assisting and driving business values (operationally and strategically) becomes prominent. Family businesses exhibiting strong technology orientation will adopt new and novel technologies such as Artificial Intelligence. Thus, we hypothesize as:

> H4: Family business technology orientation towards AI in digital entrepreneurship influences adoption intention of AI in the family business

Organizational technology orientation is vital in developing new ideas, products, processes, and systems (Henard and Szymanski, 2001; Zhou, Yim and Tse, 2005). Organizations that proactively participate and adopt and utilize new, novel, and advanced technologies might contribute to improved business innovations. This is due to their emphasis on using them to meet customer requirements and be competitive in the market (Cooper, 1994). The organizational level of technology orientation influences its ability to attain business innovativeness. Family businesses can leverage technology orientation to advance and improve business innovativeness. As such, we posit the following hypothesis:

> H5: Family business technology orientation towards AI in digital entrepreneurship influences business innovativeness

2.4.5 Culture & Flexible Design

An organization's culture refers to "the social or normative glue that holds an organization together and expresses the values or social ideals and beliefs that organization members come to share" (Cooper, 1994). An organization's culture is vital for technological advancements, developing products and services, exploring opportunities, and attaining business values. Gurbaxani and Dunkle (2019) advise checking and (re) aligning an organization's culture and workforce flexibility with the ever-increasing dynamics of the digital business context. It

implies organizations have to transform their culture to respond to new and innovative developments. Samara and Terzian (2021) advocate that cultural flexibility as necessary to operationalize digital entrepreneurship. Organizational culture is a powerful unifying force that promotes agreement, understanding of procedures and practices in a shared manner. As such, organizational culture reflects the groups and their manifestation around underlying technology. Chrisman, Chua and Litz (2003) argue that culture dynamism is more prevalent in the family business than in non-family business (Singal and Gerde, 2015, p. 12), which might influence the adoption of new technologies. As such, Cooper (1994) discusses relooking at people, tasks, and structure when an organization's culture conflicts with technology. Samara, and Terzian (2021) discuss the significant role of culture and flexibility in accelerating the digital transformation to (re)define business value chain, business models and engagement. Concerning the family business, we argue that culture and flexible design aspects affect the adoption of emerging technology such as Artificial Intelligence.

H6: Family business culture & flexible design in digital entrepreneurship influences adoption intention of AI in the family business

As business innovativeness is vital for the organization's success, several scholarly research work focuses on identifying its determining factors (Crossan and Apaydin, 2010). Organization culture and design emerged as the most influential factor in the earlier studies (Mumford, 2000). Organizational culture and flexible design can encourage business innovativeness among the workforce because it drives them toward accepting business innovativeness as an organizational philosophy. Earlier research studies provide enough evidence to establish relationships between organization culture and flexible design, and business innovativeness (Büschgens et al., 2013; Lin et al., 2013; Naranjo-Valencia et al., 2016; Rezaei et al., 2018; Uzkurt et al., 2013). Therefore, we posit the following hypothesis:

H7: Family business culture & flexible design in digital entrepreneurship influences business innovativeness in the family business

2.4.6 Entrepreneurial Orientation

Entrepreneurial orientation depicts organizational tendency in exploring potential opportunities (Boso et al., 2013) via developing supportive capabilities such as pro-activeness, innovativeness, risk-taking, opportunity-seeking, autonomy and competitive aggressiveness (Lumpkin and Dess, 1996). The management team needs to understand and be ready to respond to the changes thrown by digital technology. Additionally, they have to be cognizant of the interactions and relationships dynamics of the customers with the firms and the products and services (Berman, 2012; Hughes, 2017). Naman and Slevin (1993) argue that entrepreneurial orientation facilitates the organization to innovate and adapt to the competitive market environment. Organizations, through business innovativeness, create value for themselves and clients, and consumers (Weerawardena, 2003) by developing new ideas, products, and processes. In this regard, organizations have to continuously sense the environment's dynamism and seek the opportunity to participate and compete in the market (Preda, 2013). As such, entrepreneurial orientation reflects how organizations have to leverage the market opportunities either proactively or conservatively. Therefore, Rauch et al. (2009) argue that organizations can generate business innovation by considering entrepreneurial orientation as a strategic decision-making process. For that reason, by developing and improving entrepreneurial orientation, business innovativeness can be improved (Beekman, Steiner and Wasserman, 2012) as one of its key activities is to develop new ideas, products, systems, and processes. Therefore, we posit the following hypothesis:

H8: Family business entrepreneurial orientation in digital entrepreneurship influences business innovativeness in the family business.

Hughes (2017) argue that organizational leaders must exhibit the capability to examine and understand the potential implications of the technology marketplace. Zaheer et al. (2019) demonstrate that successful digital start-ups founder exhibits an entrepreneurial mindset and can sense and explore the market; able to discover technological implications and respond promptly to marketplace dynamics. Hughes (2017) mentions that entrepreneurially oriented individuals focus on problems, opportunities, and outcomes rather than current products, services, and activities. Considering family business, collective entrepreneurial orientation can come from members of the family or their agents or the manifestation of a group of employees or management team (Babinet, 2018; Bettinelli et al., 2014). EO is vital for family firms' competing in the digital space towards achieving digital entrepreneurship. AI potential in supporting, assisting and driving business showcasing both operational and strategic implication to business attract family business to exploit it. We argue the family business exhibiting potent EO will adopt new and novel technologies such as Artificial Intelligence. Thus, we hypothesize as:

H9: Family business entrepreneurial orientation in digital entrepreneurship influences adoption intention of AI in the family business

2.4.7 Business innovativeness

Business innovativeness refers to the "organization's capabilities to explore and exploit new market opportunities by leveraging new technologies, policies and best practices for competitive advantage within the industry and globally" (Seyfang and Smith 2007). When engaging in and supporting new ideas, experimentation, creative processes, and entrepreneurial pursuits, organizations tend to generate business value by developing new and novel products and services in terms of products and services (Lumpkin and Dess, 1996). Kellermanns et al. (2012) argue business innovativeness is vital for the family business for its continuity and competitive advantage. Further, firms exhibiting great business innovativeness tend to utilize

new and innovative technologies to develop new and novel products and services. Gudmundson, Tower and Hartman (2003) demonstrate evidence of higher innovations by family businesses than non-family businesses. We argue the family business exhibiting strong business innovativeness will adopt new and novel technologies such as Artificial Intelligence. Thus, we hypothesize as:

H10: Business innovativeness in digital entrepreneurship influences adoption intention of AI in the family business

The extant literature has sufficiently established the role of business innovativeness towards behavioural intentions (Upadhyay, 2019; Upadhyay, 2020). Research suggests that firms demonstrating a high level of innovation tend to showcase behavioural intention towards new and novel technologies (Aboramadan et al., 2020) to develop new ideas, processes, products, and systems (Kraśnicka, Głód, and Wronka-Pośpiech, 2018). Crossan and Apaydin (2010) and Mumford (2000) argue the role of culture and organizational design to foster innovations. For example, earlier studies found aspects of cultural values and organizational design such as freedom and autonomy (Ahmed, 1998; Aboramadan et al., 2020), teamwork (Arad et al., 1997; Aboramadan et al., 2020), and flexibility (Martins and Terblanche, 2003; Aboramadan et al., 2020) to improve a firm's innovation. Additionally, entrepreneurial orientation plays a vital role in a firm's innovation as it facilitates improving commercial and market activities (Nieto, Santamaria, and Fernandez, 2015; Yuan et al., 2015). Besides, a firm's technology orientation enables its level of innovation (Zhou et al., 2005). Though relationships of EO, TO, CFD, and BI with behavioural intentions have been examined in earlier studies, the role of BI in mediating relationships between EO, TO, CFD and BI with behavioural intentions (adoption) has not yet been explored. We argue that additional insight regarding the role of BI for the relationships between EO, TO, CFD, and intentions is needed in the context of family business adoption intention of AI. As such, we posit the following:

H11: Business innovativeness in digital entrepreneurship mediates the relationships between (a) technology orientation (b) culture & flexibility design (c) entrepreneurial orientation and adoption intention of AI in the family business

The theoretical research model is shown in Figure 1.

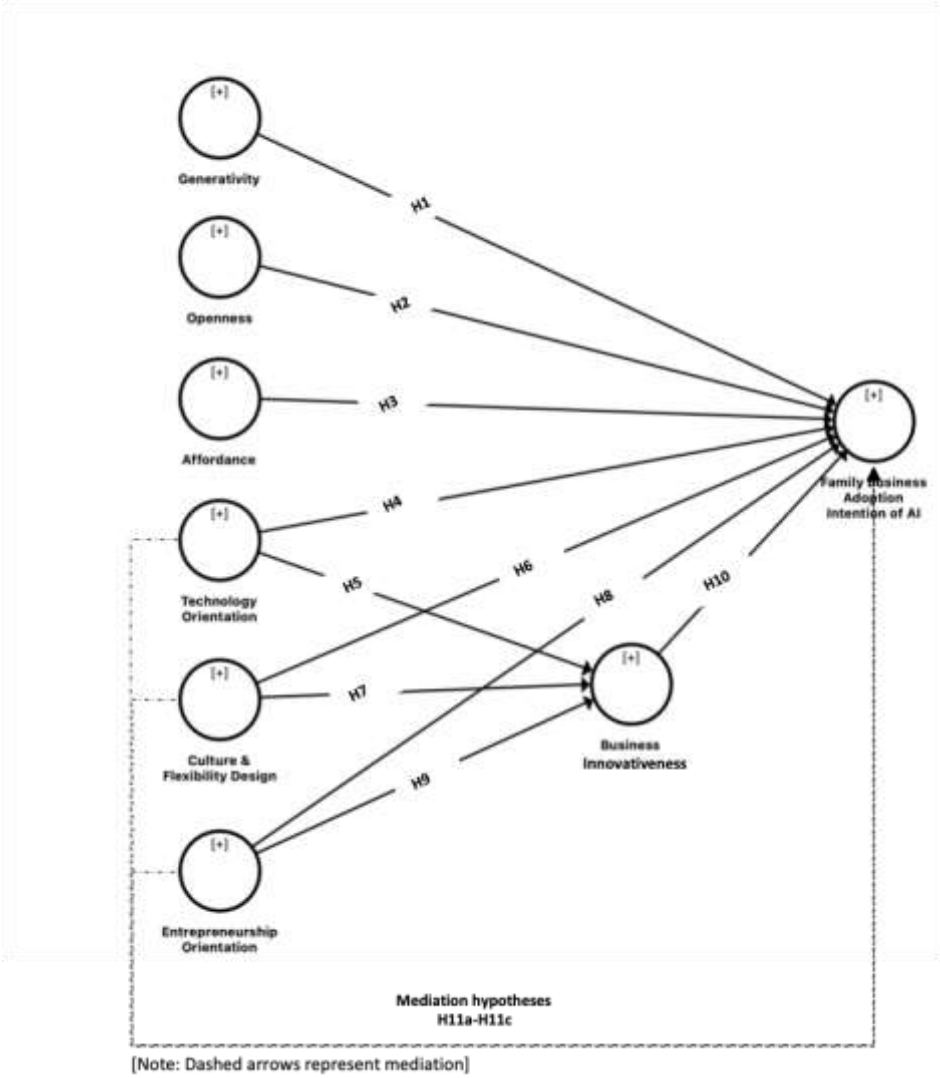


Figure 1 Family Business Artificial Intelligence Adoption Intention Model

3. Methodology - Data Collection and Sample

We follow the quantitative survey methodology as the validated instruments were readily available from the earlier studies (Upadhyay, Upadhyay and Dwivedi, 2021; Miller, 1983; Gatignon and Xuereb 1997; Seyfang and Smith 2007; Dettmers et al. 2013; Bamgbade et al., 2019; Dutot and Bergeron, 2016; Fan et al., 2021) to measure the latent constructs (Fowler Jr,

2002) to examine the contribution of the vital factors explaining the adoption intention of AI. The survey questionnaire consisted of 30 items set for the constructs- openness (3-items), generativity (3-items), affordance (3-items), entrepreneurial orientation (5-items), technology orientation (4-items), business innovativeness (4-items), culture & flexibility (5-items) and family business adoption intention of AI (3-items). The questions were close-ended with multiple choices for the respondents to select. A seven-point Likert scale, where "1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neither agree nor disagree; 5 = somewhat agree; 6 = agree; 7 = strongly agree" was employed for the respondents to rate each question. Table A.1 presents the items and sources of the constructs. The study incorporated a self-administered questionnaire to reduce the risk of the reliability of the information. The self-administered questionnaire ensured that the differences in asking questions and their presentation were eliminated (Fowler Jr, 2002). We utilize purposeful sampling to gather data from the family business respondents in India (Dwivedi, Khan and Papazafeiropoulou, 2007). First, we utilized Prowess database maintained by Centre for Monitoring Indian Economy (CMIE) that contains financial and shareholding data, annual reports and other information filed with regulatory agencies of a large number of listed and unlisted companies. It is the most widely used database for research on Indian companies. We baseline the family businesses from the BSE 500 index businesses. BSE 500 represents more than 90% of the market capitalization of BSE representing all types of businesses. Therefore, it serves as the best representation of the Indian market. Second, we approach the Confederation of Indian Industry (CII) and the entrepreneurship unit of various institutes of National Importance in India to connect to the respondents as they possess direct communication with the family businesses.

Four experts from the premier institute of India established the face validity of the questionnaire. Based on their suggestions, certain items were reworded for clarity in the study. The questionnaire's effectiveness in terms of its clarity was checked using a pilot study for a

small population group. Researchers noted the time duration taken to answer the questionnaire. The researchers incorporated an introduction section to acquaint the potential respondents with the survey and its purpose based on the pilot study results. Based on the required amendments, the questionnaire was considered appropriate for the actual study. The survey questionnaire was administered through online survey (Google survey form) among the potential respondents based on their consent to participate in the research. Ilieva et al. (2002) suggest that "online surveys' average response time is 5.59 days". We kept the survey open for 21 days (between 11-01-2022 and 31-01-2022) considering the slack time due to ongoing pandemic. A total of 899 questionnaires were administered, with 761 filled questionnaires returned. Screening of the filled questionnaire revealed that 130 questionnaires contained missing data and fields. After discarding the questionnaires with missing data, a final respondent size of 631 was obtained for the research giving a response rate of 70.18%. As the survey was administered through online mode, we also tested for a non-responsive bias and mean difference for the early and late respondents as recommended by Armstrong and Overton (1977). We did not observe any significant difference on the responses of early and late respondents. Likewise, the non-responsive bias observed to be low.

4. Results

4.1 Profile of respondents

The profile of respondents consisting of 631 respondents is shown in Table 2. The final data of respondents comprised 65.1% male and 43.8% female respondents. A significant part of the total sample, belonged to the 36-45 (36.4%) and 46-55 (26.9%) years age group, followed by 17.4% (n= 110) belonging to the 26-35 years age group. Regarding the respondents' educational qualifications, 30.4% respondents were bachelor's degree holders, 64.9% are postgraduates degree holders and 4.5% are doctorate holders. The turnover of the family businesses falls in the range of Rs. 3.3 million ~ Rs. 53275.33 million. The dominant industry

types are Manufacture of chemicals and chemical products (12), Manufacture of pharmaceuticals, medicinal chemical and botanical products (14), Manufacture of basic metals (16), Computer programming, consultancy and related activities (14), Hotels & restaurants (5), and Health Services (7). The detailed demographic characteristics of respondents are provided in Table 2.

Table 2. Demographic profile of respondents

Category		Frequency	Percentage
Gender	Male	411	65.1%
	Female	220	43.8%
Age	18-25	36	5.7%
	26-35	110	17.4%
	36-45	230	36.4%
	46-55	170	26.9%
	55 and above	85	13.4
Educational Background	Bachelor's degree	192	30.4%
	Postgraduate degree	410	64.9%
	Doctorate	29	4.5%
Marriage Status	Single	185	38.86
	Married	291	61.13

Respondents Industry

Industry turnover range is of Rs. 3.3 million ~ Rs. 53275.33 million

Industry types	Total Industry	Industry types	Total Industry
Manufacture of chemicals and chemical products	12	Computer programming, consultancy and related activities	4
Manufacture of pharmaceuticals, medicinal chemical and botanical products	14	Hotels & restaurants	5
Manufacture of basic metals	16	Health Services	7

4.2 Common method bias

Podsakoff and Organ (1986) suggest checking for a presence of a common method bias (CMB) to avoid any measurement errors. Due to the collection of data through a single survey, the results might get inflated which can be verified by performing Harman's single-factor analysis (Ahrholdt, Gudergan, and Ringle 2017). We find the absence of CMB as the single factor aggregate variance is accounted for 43% which is less than 50% thus CMB does not affect the data.

4.3 Measurement Model

We perform the analysis for the measurement model. We check for constructs reliability and validity to verify the suitability of the measurement model. We perform various tests (Hair et al., 2010; Hair et al., 2016; Dijkstra and Henseler, 2015) such as - Cronbach's alpha (Cα), Composite Reliability (CR) and Consistent Reliability Coefficient (rho_A). We observe that for all the tests the results are as per the acceptable threshold value (Cα>0.7, CR>0.7, rho_A>0.7) (Campbell and Fiske, 1959; Hair et al., 2010). Additionally, to examine whether the items belonging to the same construct have a high positive correlation and share a significant proportion of variance, we check the Average Variance Extracted (AVE) threshold value. We find that convergent validity as measured by AVE holds as the value is greater than 0.5 (Fornell and Larcker,1981). The summarized results of constructs reliability and validity are shown in Table 3.

Table 3. Constructs reliability and validity

	FL	Cα	[a]rho_A	CR	AVE
Affordances (AFD)		0.918	0.918	0.948	0.859
AFD1	0.921				
AFD2	0.927				
AFD3	0.932				
Business innovativeness (BI)		0.936	0.936	0.954	0.84
BI1	0.907				

BI2	0.931				
BI3	0.909				
BI4	0.918				
Culture & Flexible Design (CFD)		0.935	0.936	0.95	0.792
CFD1	0.889				
CFD2	0.891				
CFD3	0.896				
CFD4	0.903				
CFD5	0.871				
Entrepreneurial Orientation (EO)		0.94	0.941	0.954	0.805
EO1	0.902				
EO2	0.912				
EO3	0.883				
EO4	0.889				
EO5	0.900				
Family Business Adoption Intention of AI (FBAIAI)		0.893	0.893	0.933	0.823
FBAIAI1	0.888				
FBAIAI2	0.915				
FBAIAI3	0.881				
Generativity (GE)		0.938	0.941	0.96	0.89
GE1	0.945				
GE2	0.942				
GE3	0.943				
Openness (OP)		0.921	0.921	0.95	0.863
OP1	0.923				
OP2	0.937				
OP3	0.927				
Technology Orientation (TO)		0.948	0.948	0.962	0.865
TO1	0.932				
TO2	0.928				
TO3	0.935				
TO4	0.925				

[Note: FL = Factor loading, Cα = Cronbach alpha, rho_A = Consistent Reliability Coefficient, CR = composite reliability, AVE = average variance extracted, [a]Reliability coefficient > 0.7]

Finally, to verify the distinctness of the construct concepts, we perform the Heterotrait–Monotrait Ratio of correlations (HTMT) test (Ahrholdt, Gudergan, and Ringle 2017; Henseler,

Ringle, and Sarstedt, 2015). We also use Fornell–Larker Criterion to concur the results with HTMT tests. Table 4 and Table 5 represent that both the tests confirmed the presence of the discriminant validity (Fornell and Larcker,1981; Kline, 2015). We conclude, that all the tests showcase that the measurement model is suitable for examining the structural model.

Table 4. Discriminant validity- Fornell–Larker Criterion.

Fornell–Larker Criterion	1	2	3	4	5	6	7	8
(1) Affordances	**0.927**							
(2) Business innovativeness	0.388	**0.916**						
(3) Culture & Flexible Design	0.626	0.442	**0.89**					
(4) Eentrepreneurial Orientation	0.478	0.372	0.499	**0.897**				
(5) Family Business Adoption Intention of AI	0.627	0.522	0.644	0.567	**0.907**			
(6) Generativity	0.605	0.574	0.609	0.55	0.669	**0.943**		
(7) Openness	0.558	0.389	0.542	0.476	0.603	0.589	**0.929**	
(8) Technology Orientation	0.584	0.391	0.512	0.503	0.644	0.588	0.548	**0.93**

Note: values on diagonal which are **bold** are the square root of AVE.

Table 5. Discriminant validity- Heterotrait-Monotrait Ratio

Heterotrait-Monotrait Ratio	1	2	3	4	5	6	7	8
(1) Affordances								
(2) Business innovativeness	0.418							
(3) Culture & Flexible Design	0.676	0.47						
(4) Eentrepreneurial Orientation	0.514	0.395	0.53					
(5) Family Business Adoption Intention of AI	0.693	0.571	0.703	0.618				
(6)	0.65	0.614	0.648	0.582	0.73			

Generativity (7)							
Openness (8)	0.607	0.419	0.583	0.509	0.665	0.631	
Technology Orientation	0.627	0.415	0.545	0.531	0.699	0.622	0.586

Note: HTMT<0.85 (Kline, 2015)

4.4 Structural model assessment

We performed structural model assessment to examine its predictive power and construct relationships significance (Hair et al., 2016). In the model, we have two endogenous construct (Family Business Adoption Intention of AI and Business innovativeness) and six exogenous constructs (Affordances, Culture & Flexible Design, Entrepreneurial Orientation, Generativity, Openness, and Technology Orientation). The endogenous variable showcased ample variance explained through the R square (R^2) for Family Business Adoption Intention of AI (64.2%) and Business Innovativeness (24.6%). We applied a bootstrapping procedure with 5000 re-samplings to test both the path estimates and t-statistics, as the data was devoid of any multivariate normality issues (Hair et al., 2016) as depicted in Table 6. We verify the collinearity using Variance Inflation Factor (VIF) measures and find the multicollinearity absence as the VIF value for all the items are in the range between 1.490 and 2.546 (Diamantopoulos and Siguaw, 2006; Hair et al. 2010).Results summarized in Table 7 show that all the associations have p-values < 0.05, and T-statistic> 1.96 (for a significance of 5%) (Hair et al. 2016), thus, we conclude that all the hypothesized relationships are significant.

Table 6. Full collinearity test for inner VIF value

Hypothesis	**Input Variable**	**Output Variable (Inner VIF Value)**	
		Business Innovativeness	**Family Business AI Intention**
H3	Affordance		2.13
H10	Business Innovativeness		1.53
H6;H7	Culture & Flexibility Design	1.516	2.05
H8;H9	Entrepreneurial Orientation	1.490	1.633

	Family Business AI Intention		
H1	Generativity		2.546
H2	Openness		1.856
H4LH5	Technology Orientation	1.524	1.905

Further, we perform an assessment of the predictive relevance of the model (Q^2) by using Blindfolding to compute the Q^2 for the endogenous variables – business innovativeness (0.205) and Family Business Adoption Intention of AI (0.523). As the Q^2 value of the endogenous variables are greater than 0, the presence of predictive relevance and a greater than large size effect is evident. Additionally, we perform an assessment of the model's predictive power using the PLS Predict algorithm. The PLS Predict algorithm checks through Q^2_predict whether the model can outperform most naïve linear regression benchmarks (Shmueli et al., 2016). We observe lower prediction errors for all items than naïve linear regression benchmarks. As such, we conclude that the proposed model depicts high predictive performance. Further, we assess the effect size of each endogenous variable using f^2 measure (do Valle and Assaker, 2016) to check the model's predictive stability. All variables except affordances (effect size = 0.07) and entrepreneurial orientation (0.08) depicts having greater than small effect size as their f^2 fell between 0.021 and 0.16 (e.g., effect: large >= 0.35, medium > = 0.15, small >= 0.02) (Cohen, 1992). The model is evaluated considering the fit indices such as Root mean square residuals (RMSR) and Normed fit index (NFI) and found to satisfy the cut-off criteria of the indices (SRMR < 0.08 and NFI > 0.90) (Dash and Paul, 2021). Through our analysis, we conclude that our model explains the endogenous constructs and showcases high predictive relevance, power and stability, see Table 7. Figure 2 shows an empirically validated research model.

Table 7. Hypotheses results [Path Coefficients and Confidence intervals; Model fit and Predictive Power]

Explanatory paths	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	2.50%	97.50%	P Values
H1	0.122	0.121	0.034	3.584	0.053	0.187	0

H2	0.136	0.136	0.032	4.2	0.069	0.199	0
H3	0.281	0.284	0.043	6.542	0.202	0.366	0
H4	0.184	0.184	0.039	4.741	0.112	0.261	0
H5	0.144	0.143	0.045	3.219	0.058	0.226	0.001
H6	0.124	0.127	0.028	4.44	0.065	0.179	0
H7	0.138	0.141	0.043	3.194	0.057	0.222	0.001
H8	0.126	0.123	0.034	3.711	0.064	0.188	0
H9	0.175	0.172	0.042	4.161	0.092	0.257	0
H10	0.212	0.211	0.034	6.296	0.156	0.288	0

Model Fit		
	Saturated Model	Estimated Model
SRMR	0.033	0.047
NFI	0.91	0.912

Construct Cross Validated redundancy (Predictive and Explanatory Power)

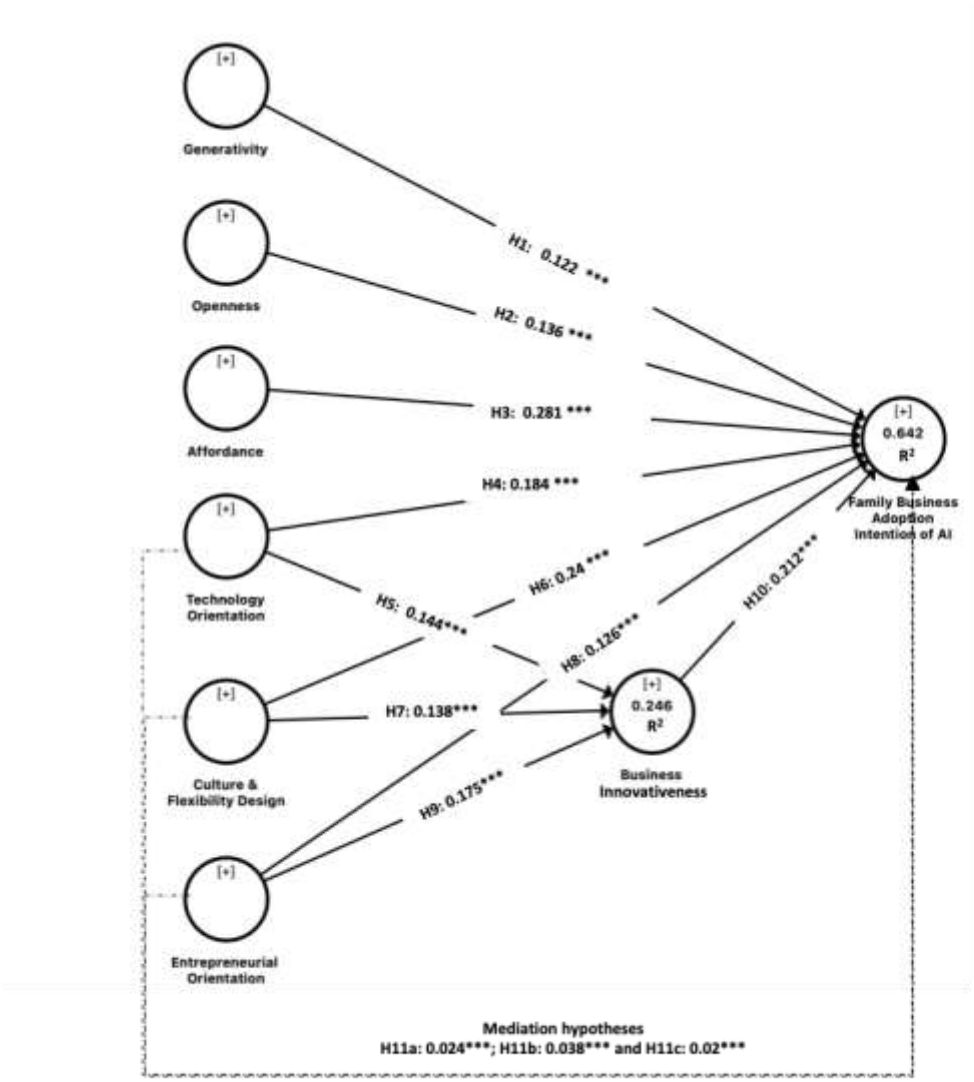
	Q^2	Q^2_predict	R^2
Business Innovativeness	0.205	0.238	0.246
Family Business Adoption Intention of AI	0.523	0.621	0.642

4.5 Mediation Analysis

We employ Hair et al. (2016) method to perform a mediation analysis of business innovativeness. Considering MacKinnon et al. (2002), "rule Z mediates the link between X and Y if the direct path between X to Z and Z to Y is significant". The results demonstrate that the direct paths from EO to BI (β = 0.175, p = 0.000), TO to BI (β = 0.144, p = 0.001), CFD to BI (β = 0.138, p = 0.001) and from BI to FBAIAI (β = 0.212, p = 0.000) were positive and statistically significant. Accordingly, Matthews, Hair and Matthews (2018) proposed that full mediation is established when the indirect path is significant while the direct path is insignificant; if both the direct and indirect paths are significant, partial mediation is established. Business innovativeness partially mediated the EO– BI– FBAIAI, TO–BI– FBAIAI, and CFD– BI– FBAIAI relationships (Table 8).

Table 8. Mediation Analysis: Direct and Indirect effects

Explanatory paths	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	2.50%	97.50%	P Values
Direct effect							
H4	0.184	0.184	0.039	4.741	0.112	0.261	0
H5	0.144	0.143	0.045	3.219	0.058	0.226	0.001
H6	0.124	0.127	0.028	4.44	0.065	0.179	0
H7	0.138	0.141	0.043	3.194	0.057	0.222	0.001
H8	0.126	0.123	0.034	3.711	0.064	0.188	0
H9	0.175	0.172	0.042	4.161	0.092	0.257	0
H10	0.212	0.211	0.034	6.296	0.156	0.288	0
Indirect Effect							
H11a: Technology Orientation -> Business Innovativeness -> Family Business Adoption Intention of AI	0.024	0.023	0.008	2.932	0.011	0.045	0.004
H11b: Culture & Flexibility Design -> Business Innovativeness -> Family Business Adoption Intention of AI	0.038	0.039	0.012	3.313	0.018	0.064	0.001
H11c: Entrepreneurial Orientation -> Business Innovativeness -> Family Business Adoption Intention of AI	0.02	0.02	0.008	2.485	0.007	0.037	0.013



[Note: Significance of p-Value: p > 0.05(ns): Non-significant; p < 0.05: *; p < 0.01: **; p < 0.001: ***; R^2: Variance explained]; Dashed arrows represent mediation]

Figure 2 empirically validated research model

4.6 Importance-performance map analysis (IPMA)

We perform the importance-performance map analysis, which helps to determine contributing factors having relatively high importance for the outcome of interest (i.e., those that have a strong total effect), but also depict a relatively low performance (i.e., low average latent variable scores). An IPMA relies on two essential elements in an unstandardized form - total effects and the rescaled latent variable scores. Through rescaling, each latent variable score gets a value between 0 and 100 (e.g., Höck et al., 2010; Kristensen et al., 2000). The construct's performance represents the mean values of these scores, with 0 indicating the lowest and 100

indicating the highest performance. Construct's importance relies on its total effect on the target construct. Hair et al., (2019) suggest interpreting IPMA results as "a one-unit increase of the predecessor's performance increases the performance of the target construct by the size of the predecessor's unstandardized total effect, if everything else remains equal (ceteris paribus)". Additionally, a four-quadrant importance-performance map is developed (Martilla and James, 1977; Hair et al., 2019) which depicts Q1 (it does not matter and no performance), Q2 (Some improvements is needed), Q3 (non-important aspect is having high performance) and Q4 (Management is fine so sustain it).

Results in Figure 3 depict that for business innovativeness, construct technology orientation needs attention to improve performance, while constructs culture & flexibility design and entrepreneurial orientation need a push. Besides, culture & flexibility has relatively higher performance and importance than business innovativeness and technology orientation. Similarly, for the adoption intention of AI in the family business, constructs such as business innovativeness, technology orientation, and generativity needs attention for improving their respective performances. Culture & flexibility has emerged as having relatively higher importance than any other constructs. A push in the performance improvements of culture & flexibility, affordance, openness, and entrepreneurial orientation is required. Constructs performance and importance are shown in Table 9 and Table 10 respectively.

Figure 3 . Importance-Performance Map Analysis of business innovativeness and family business adoption intention of AI

Table 9. Constructs performance

Constructs	Performances (Value: 0~100)
Affordances	54.125
Business Innovativeness	40.951
Culture & Flexible Design	51.235
Entrepreneurial Orientation	51.493
Family Business Adoption Intention of AI	61.269
Generativity	41.066
Openness	51.477
Technology Orientation	47.73

Table 10. Constructs Importance (Unstandardized Total Effects)

Construct	Business Innovativeness	Family Business Adoption Intention of AI
Affordances		0.105
Business Innovativeness		0.135
Culture & Flexible Design	0.281	0.175
Entrepreneurial Orientation	0.138	0.114
Generativity		0.111
Openness		0.101
Technology Orientation	0.163	0.19

5. Discussion

The current study developed a research model and empirically validated it by explaining factors contributing to artificial intelligence adoption intention in the family business. We first

identified critical factors through the perspectives of digital entrepreneurship and entrepreneurial orientation that influence the adoption intention of artificial intelligence. Then we empirically validated the significance and explanation of the research model.

The proposed model included two endogenous (i.e., adoption intention and business innovativeness) and six exogenous variables (i.e., affordances, culture & flexible design, entrepreneurial orientation, generativity, openness, and technology orientation). This study examined and analyzed factors that influence the adoption intention of artificial intelligence in the family business. The results depicted that our model explains the endogenous construct and showcase high predictive relevance, power and stability. The result demonstrated a model variance of 24.6% for business innovativeness and 65.3% explaining the adoption intention of artificial intelligence in the family business respectively. The factor culture & flexible design emerged as the top factors contributing to the adoption intention's explanation. It is suggested that family businesses building conducive culture & flexible design greatly influence the inclination to adopt artificial intelligence. Undoubtedly, the workforce will be able to test run the pilot projects, share setbacks and success and build competency by upholding shared values. The results corroborate with the earlier studies (for example, Ogbonna and Harris, 2005; Bamgbade et al., 2019). Ogbonna and Harris (2005) argue the significance of culture & flexible design in adoption in family firms. Additionally, Bamgbade et al. (2019) demonstrate the significant influence of culture & flexible design to adopt technology in the construction industry as a vital component of the organizational capabilities to achieve sustainability.

Similarly, the study confirms earlier study findings indicating that business innovativeness (Bamgbade et al., 2019; Thong and Yap, 1996) and technology orientation (Olivia, Lee and Meuter, 2010; Hunter and Perreaul, 2006) influence the adoption intention of the technology. Olivia, Matthew and Meuter (2010) demonstrate technology orientation as the significant

factor explaining the adoption intention of EHR systems in the healthcare industry. They mentioned that technology orientation helps the workforce map hospital administrative and business functions with the EHR. Likewise, Hunter and Perreaul (2006) note that technology orientation contributes to sales technology's adoption intention. Business innovativeness partially mediate the relationships of entrepreneurial orientation, culture and organizational design, and technology orientation with behavioural intentions. Bamgbade et al. (2019) and Thong and Yap (1996) discuss the importance of business innovativeness to adopt technology to achieve competitive advantage. Scholars witness that the top leadership in the business depicts the decision-making and business innovativeness of the firm (Rizzoni, 1991; Rothwell, 1977). As such, it is paramount for the top leaders in the business to be cognizant of the latest developments and able to develop sensemaking of the market dynamics.

The current study findings reveal entrepreneurial orientation as a significant factor affecting the adoption intention of artificial intelligence. Such results depict that family businesses act entrepreneurially to attain a competitive advantage in the fierce dynamics of the marketplace. Considering opportunity growth in artificial intelligence technology in businesses, family business EO plays a vital role in adopting artificial intelligence. Our findings corroborate earlier studies (Fan et al., 2021; Karami and Tang, 2019; Sahaym, Datta, and Brooks, 2019; Wiklund and Shepherd, 2003). Our current study findings also concur with the suggestions of the earlier studies (Nambisan, Wright and Feldman, 2019; Upadhyay, Upadhyay and Dwivedi, 2021) which focus on the importance and role of openness, generativity and affordances for digital entrepreneurship. Our findings suggest openness, generativity, and affordance influence the adoption intention of AI. To be more relevant and competitive, by utilizing emerging technology (for example, AI), family businesses can explore the marketplace and operationalize entrepreneurial opportunities (Tiwana, 2014; Wareham et al., 2014). Family businesses can strategize digital transformation plans which are driven by AI. Market services

operationalize the availability of AI services, products and solutions through various channels (open source, collaboration and outsourcing). Along with this it also offers open standards and open APIs for horizontal and vertical solutions (Pfau and Rimpp, 2021). In this way, the generativity and affordance affect the adoption of AI.

5.1 Theoretical implications

Concerning the family business context, our study is the first to attempt an explanation of artificial intelligence adoption intention in the digital entrepreneurship space. Theoretically, it contributes to the literature of entrepreneurship, especially digital entrepreneurship (Bettinelli et al., 2014; Nambisan, Wright and Feldman, 2019; Basly and Hammouda, 2020). Additionally, our research model adds to the role of entrepreneurial orientation and digital entrepreneurship in the emergent family entrepreneurship literature. Considering the scarcity of research in this field, the empirically validated model explaining critical antecedents of AI adoption intention in the family business is a foundation for discussion, critique and future research. The study is in response to the call by Nambisan, Wright and Feldman (2019) and Basly and Hammouda (2020) to develop, explore and explain factors contributing to digital entrepreneurship. We argue that family businesses need to have following characteristics to be able to embark into the digital entrepreneurship space and operationalize entrepreneurship pursuits: (a) exhibit entrepreneurial orientation, (b) offer conducive culture and flexibility, (c) showcase technology orientation and business innovativeness, (d) understand openness, generativity and affordance of the technology. Moreover, business innovativeness, entrepreneurial orientation, and the organization's culture and flexible design appeared as the core (top) important factors driving the adoption intention of the emerging technology - artificial intelligence. The findings of our research corroborate with earlier research work. Furthermore, the study extends the work of Chrisman et al. (2015) by explaining the significance of entrepreneurial orientation and business innovativeness in the family business. While Chrisman et al. (2015) considered

aspects such as risk aversion as severe impediments towards leveraging technology resulting in low innovation, we argue that family businesses that have strong entrepreneurial orientation venture into new entrepreneurship endeavours, explore new marketplace opportunities and leverage emerging technologies. We demonstrate that family firms exhibiting strong entrepreneurial orientation influence the adoption intention of artificial intelligence.

We establish partial mediation of business innovativeness and provide additional insights regarding the role of BI for the relationships between entrepreneurial orientation, technology orientation, culture and flexibility design, and intentions in the context of family business adoption intention of AI. We argue businesses involved in business innovativeness growth tend to adopt novel and new technologies. The present study also extends the existing literature by providing empirical insights from a business innovativeness viewpoint and its mediating role with good explanatory power. So, it is vital for the family business to examine and assess its current level of business innovativeness. This research provides detailed examination of entrepreneurial orientation and digital entrepreneurship and also improves research on business innovativeness.

5.2 Implications to practice

The empirically validated research model and the findings of the study could be undertaken as a set of recommendations. In the current study, we show that family business exhibits numerous factors contributing to the adoption intention of AI. Although research in family business entrepreneurship discusses entrepreneurial orientation, we recommend the development of entrepreneurial orientation by undertaking training in digital entrepreneurship. Further, we advise the family business to develop an awareness of new developments and understand the market dynamics to be able to adapt and respond appropriately. By having entrepreneurial orientation family businesses can become more agile and responsive to embrace new

opportunities. Considering our IMPA results, we suggest business innovativeness and generativity needs attention and improvement, while technology orientation requires a slight push in the improvements. Additionally, culture & flexible design is surfaced as the most important construct. As culture & flexible design appeared to be the critical determinant of the adoption intention of AI, we advise the family business to relook at the culture & flexibility status to examine any conflict of organizational value with the adoption intention of AI. A thorough check on the prevalent culture & flexible design help the family business to investigate the gaps and craft appropriate strategies towards the adoption of artificial intelligence. It is necessary to identify the components of business that are being affected by the adoption of AI. Precisely, identification of operational, financial and strategic implications help family business to (re)orient and (re)align culture & flexible design. We suggest family businesses examine AI openness, affordance and generativity aspects specific to the business context. It implies that family businesses operate in different contexts, having varied capabilities and requirements thus need to weigh the AI solutions impacting business model in incremental, moderate and large ways. Even proper awareness and training to be designed to sensitize the workforce about the potential opportunities and appropriateness of the AI. In addition, the family business has to motivate the workforce and upskill them to explore and exploit AI. By doing so, the family business will be able to overcome workforce inertia towards AI adoption. Accordingly, we recommend that intentional improvement planning needs to be conceived and operationalized to strengthen the family business perception of AI affordances, generativity and openness towards its adoption.

We suggest family businesses operationalize lucrative incentives for AI-digital entrepreneurship research and development (R&D) ventures and activities. We advise developing and forging of business and IT teams to pilot target projects for specific outcomes. They can also allocate specific funds to both undertake entrepreneurship pursuits & ventures

and workforce upskilling. Additionally, they need to update their governance and policy frameworks to strategize AI adoption (Kitchin, 2014; World Economic Forum, 2012). Framing such a strategy boost family business to appreciate AI appropriateness and use. Additionally, family businesses can explore and exploit open data, open APIs and fast integrated solutions to appreciate openness in scaling their offerings (Kim et al., 2014).

5.3 Limitations and Future Research

This research examines critical factors explaining the family business AI adoption intention. However, still, the undertaken study is not devoid of all limitations. Firstly, the study examines the cross-sectional data that limits the focus and boundary of the family business context. However, future studies should consider longitudinal data and varying levels of analysis (industry, organization, individual) to strengthen the explanation of the adoption intention of AI. Secondly, the study deployed quantitative research to explore the determinants of the AI adoption intention. However, future studies can undertake a mixed approach to examine the family business intention towards adopting AI. Thirdly, the study has not investigated any specific AI tools adoption intention in the family business, thereby limiting the scope of weighing tool-specific adoption intention. However, future studies can focus on any particular tools, such as voice and chat assistants, to examine and investigate potential intention to adopt the tools. Finally, further studies can explore the contextual and contribution of factors such as infrastructure, change, risk, trust, leadership, governance, policy, and type of ownership (Weerakkody et al., 2007, 2009) to strengthen the variance of the proposed research model.

Our research is in response to the call by Nambisan, Wright and Feldman (2019) and Basly and Hammouda (2020) and provides theoretical developments in entrepreneurship, family business research and Artificial Intelligence (Dwivedi et al., 2021; Duan, Edwards and Dwivedi, 2019),

especially to digital entrepreneurship (Chalmers, Mackenzie and Carter, 2020; Nambisan, 2017; Nambisan, Wright and Feldman 2019; Upadhyay, Upadhyay and Dwivedi, 2021).

6. Conclusion

At the beginning of the paper, we set our objective to examine the critical factors explaining the adoption intention of AI in the family business. To operationalize the research objective, we performed a detailed review of the literature identifying critical factors. Further, we developed our research model (FBAI) comprising two endogenous (i.e., family business AI adoption intention and business innovativeness) and six exogenous variables (i.e., affordances, culture & flexible design, entrepreneurial orientation, generativity, openness, and technology orientation). We demonstrated that our model explains the endogenous constructs and showcases high predictive relevance, power, and stability based on 631 respondents' data. Furthermore, we confirmed the significant influence of all the exogenous variables on the endogenous variable reflecting support of all the hypotheses. Moreover, we established partially mediated relationships explained by business innovativeness for the entrepreneurial orientation, technology orientation, culture & flexibility design with family business AI adoption intention.

Appendix A

Table A.1. Items and sources of constructs

Construct	Items	Sources
Openness	OP1: "AI allows multilevel actors' participation, contribution, process and outcomes " OP2: "Actors' participation, contribution, process and outcomes are supported by AI" OP3: "AI provides various ways to collaborate, participate, use process to generate outcomes"	(Rothwell et. al, 1974; Upadhyay, Upadhyay and Dwivedi, 2021)
Affordance	AF1: "AI is affordable in a use context" AF2: "I require AI in a use context" AF3: "In a use context, AI is affordable"	(Faraj and Azad, 2012; Gibson, 1979; Leonardi, 2013; Upadhyay, Upadhyay and Dwivedi, 2021)
Generativity	GE1: "AI helps to create new digital artefacts, products and services" GE2: "AI provide APIs and libraries to build new digital artefacts, products and services" GE3: "I can develop new digital artefacts, products and services using AI APIs and Libraries"	(Doanld, 1991; Turner and Fauconnier, 1997; Upadhyay, Upadhyay and Dwivedi, 2021)
Entrepreneurial Orientation	EO1: "Our firm appreciate innovations above everything else" EO2: "Our firm emphasize risk taking" EO3: "Our firm intend to get into markets before our competition" EO4: "Our firm in last five years have brought several new products or services to the market" EO5: "Our firm emphasize R&D, technological leadership and innovativeness instead of trusting only those products and services, which we have traditionally found to be good"	(Dutot and Bergeron, 2016; Fan et al., 2021; Miller, 1983)
Technology Orientation	TO1: "Our firm uses innovative technologies in providing solutions" TO2: "Our firm uses state of the art of technology for products development" TO3: "Our firm is very proactive in providing innovative solutions to respond to clients' needs" TO4: "Our firm has the will and the capacity to build and market innovative solutions"	(Bamgbade et al., 2019; Gatignon and Xuereb, 1997)
Business innovativeness	BI1: "Creating new ideas, processes, products and systems is critical to the success of our firm" BI2: "Our firm tends to be an early adopter of the innovative technologies" BI3: "Our firm actively seeks innovative technologies" BI4: "Our firm proactively use innovative technologies to meet changing customer needs"	(Seyfang and Smith 2007; Bamgbade et al., 2019)
Culture & Flexible Design	CFD1: "Managers communicate to workforce the shared values of the organization" CFD2: "Workforce can identify and articulate the firm's shared values" CFD3: "Workforces' behaviours that are coherent with organizational culture are rewarded" CFD4: "Organizational shared values promote a willingness, even eagerness, to change" CFD5: "Managers provide support to workforce to reach organizational goals"	(Cooper,1994; Bamgbade et al., 2019; Iivari, and Huisman, 2007; Dettmers et al. 2013; Smircich, 1983)

Family Business Adoption Intention of AI	FBAIAI1: "Our firm is planning to adopt <accept> AI" FBAIAI2: "Our firm will adopt AI for all my requirements" FBAIAI3: "I think that our firm will adopt <accept> AI"	(Parra-Lopez et al., 2011; Upadhyay, Upadhyay and Dwivedi, 2021; Venkatesh et al., 2012)

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