Journal of Open Innovation: Technology, Market, and Complexity

Article

The Role of Skills in Islamic Financial Innovation: Evidence from Bahrain and Malaysia

Jessie Poon [1], Yew Wah Chow [2,*], Michael Ewers [3] and Razli Ramli [4]

1 Department of Geography, SUNY University at Buffalo, Buffalo, NY 14260, USA; jesspoon@buffalo.edu
2 Department of Business, SUNY Buffalo State College, Buffalo, NY 14222, USA
3 Department of Geography, University of North Carolina at Charlotte, Charlotte, NC 28223, USA; mewers@uncc.edu
4 Islamic Banking & Finance Institute Malaysia, Kuala Lumpur 50000, Malaysia; razli@ibfim.com
* Correspondence: chowy@buffalostate.edu

Received: 28 May 2020; Accepted: 2 July 2020; Published: 10 July 2020

Abstract: A body of work has emerged that examines human capital from the perspective of skills to better understand the types of expertise that influence innovation. The relationship between skill and financial innovation, however, is poorly understood in the context of Islamic financial institutions (IFIs). IFIs are distinct from their conventional counterparts by their compliance with Shariah law. Based on a survey of IFIs in Bahrain and Malaysia, this paper examines the effect of different skills on IFI innovation. The findings indicate that while skill in Islamic finance positively influences innovation, skill in Shariah law does not. Cognitive-technical skill is also highly significant, but marketing skill has a negative effect. The results suggest that Islamic financial innovation relies on continuous improvement that sustains markets, product and service innovation. Sustaining innovation lends itself to abilities that are oriented towards problem solving and computation of Shariah and business risks. This favors skills of programming and expertise in Islamic finance over marketing and Shariah legal proficiency.

Keywords: skill; innovation; Islamic financial institutions; Bahrain; Malaysia

1. Introduction

As a set of skills that is embodied in people, human capital contributes to firms' innovation capability by increasing learning and absorptive capacity [1]. Cognitive, technical and social skills that are non-routine are increasingly in demand [2], yet little is known about which skill influences firms' innovation levels. Of the few studies that have been conducted, analytical skill is found to drive radical innovation [3], while management skill and market research are found to influence incremental innovation [4]. However, few studies are concerned with financial innovation, especially innovations from Islamic financial institutions (IFIs). This paper seeks to fill the gap by examining the relationship between skills and innovation in the Islamic financial industry.

The seminal work of Robert Shiller [5] suggests that cognitive and analytical skill associated with mathematical and statistical modeling drives innovation in conventional finance. The derivative market, for example, emerged from branches of mathematical finance that have helped to price derivatives. Financial derivatives are a form of gambling [6] and can result in speculation [7,8]. But Shariah law forbids *riba* (interest), gambling and excessive speculation. Islamic financial (IF) innovation must be Shariah compliant for the product or service to be credible. Hence, while Islamic finance is concerned with market and credit risks like its conventional counterpart, it is distinguished by a second layer of Shariah risk.

Comparing conventional and IF innovations, Tables 1 and 2 show that the latter is largely composed of incremental or "sustaining" innovations that seem on the surface to be similar to those in the conventional sector. While both sectors' innovation is increasingly shaped by technology as digital platforms have gained popularity, debt securities remain relevant in conventional finance (e.g., structured note, green bond). However, an IF innovation like *sukuk* (Islamic bond) is not conceptually structured as a debt instrument. Instead an IF product must be asset-backed, or it must reflect Shariah principles of risk-sharing. Under risk-sharing, Islamic financial activities are regarded as exchanges between buyers and sellers because profits are permissible. This contrasts with transactions between borrowers and lenders in conventional banking where debt helps shape the transactions [9]. Sharing risks between buyers and sellers favors asset-based equity financing. In Table 2, for example, Malaysia's Yinson Holdings, with advisements from Maybank Investment and AmInvestment Banks, issued over $200 million *sukuk mudaraba* to finance its oil and gas infrastructure. Similarly, Bank Islam established Sadaqa House, a social account, to finance real investments in educational and healthcare infrastructure.

Dill [10] maintains that United States' (US) regulatory environment heavily focuses on mitigation of systemic risks in finance-credit risks in particular, but also operational, market and interest rate risks. Regulatory and legal frameworks set the institutional conditions for financial innovation by influencing behavior in financial firms. According to Sinclair [11], institutions, especially legal institutions, lie at the heart of financial innovation as they not only define incentives but also rights and obligations in financial contracts. Malaysia and Bahrain have become centers for Islamic financial innovation because of strong Shariah institutions. As Table 2 shows, these two countries led in many innovations from 2015 to 2019. More importantly, they have developed regulatory environments that protect religious principles to minimize Shariah risks. Bahrain's AAOIFI (Accounting and Auditing Organization for Islamic Financial Institutions) and Malaysia's ISFB (Islamic Financial Services Board) are respected for their world-setting standards in Islamic finance. New products and services developed in the two countries are seen to be gold standard and allow their IFIs to sell to other countries because they are characterized by low Shariah risks. Moreover, the central banks of both countries have separate units for conventional and Islamic finance thereby recognizing the role of Shariah in regulating risks. Such regulatory frameworks are still underdeveloped in other Muslim-dominated countries. Pakistan for instance follows the standards issued by AAOIFI and ISFB [12]. For this reason, this paper will empirically examine the relationship between Islamic financial innovation and skill based on survey data from Bahrain and Malaysia.

In the next section, sustaining versus disruptive innovation is discussed along with resource-based theory. This is followed by an outline of hypotheses relating skill types to innovation. Empirical results are elaborated next and the results are detailed along with their implications.

Table 1. Financial Innovation Comparison: Conventional versus Islamic Finance (2015–2019).

Conventional	Innovation	Description	Country
State Street	ETF Bond Fund	The world's first infrastructure exchange-traded fund (ETF) to offer investors combined exposure to both infrastructure equities and bonds [13].	USA
Citibank	Global Structured Notes-Deal of the year (2019) by MTN-i	Hybrid security containing a bond component and embedded derivative. Designed to earn enhanced income [14].	USA
Bank of America	Green Bond	First U.S. Financial Institution to issue five corporate green bonds [15].	USA
Goldman Sachs	High Yield ETF	High Yield Exchange Traded Funds are mutual funds that pay above-average interest payments that have a high risk/return exposure [16].	USA
JP Morgan Chase	18-month Buffered Return Enhanced Notes (BRENs)	Investors expected to receive 150% of the upside of the stock market and 90% of the downside [17].	USA
DBS	Joy Chatbot	Online chatbot that uses sentiment analysis to sense users' emotions. Awarded Global Finance's Payment Innovators 2019 [18].	Singapore
JP Morgan Chase	Chase Connect	To manage multiple accounts and control cash flow from one dashboard [19].	USA
JP Morgan Chase	Digit	Automated tool that helps people save money based on spending habits [20].	USA
Citibank	DX10X	An internal growth model that helps Citi employees identify, test, and validate new ideas and solutions [20].	USA
Bank of New York Mellon	Chatbots	Partnered with Deutsche Bank to create a system that would allow their respective chatbots to integrate. This allows information to move more quickly [20].	USA
UBS	Smart application	'Ask UBS' answers questions about economy and wealth management [20].	USA
Goldman Sachs	Marcus online platform	Offers no-fee, fixed-rate unsecured personal loans [21].	USA
Wells Fargo Bank	Greenhouse app	A new mobile banking experience with tools to help consumers manage their money and know where they stand financially [22].	USA
Telenor Microfinance Bank	Blockchain remittance wallet	Blockchain technology to boost the speed and efficiency of remittances [23].	Pakistan
Lloyds Bank Commercial Banking	International Trade Portal	Portal searches for suppliers and buyers to work with as trading partners view information on trading requirements and global tender opportunities [24].	United Kingdom

Table 2. Financial Innovation Comparison: Islamic Finance vs. Conventional Finance (2015–2019).

Islamic	Innovation	Description	Country
ADIB Bank Egypt	Covered cards renewal Awarded Global Islamic finance Innovator by Global Finance Magazine	Renewal process that lets customers renew their credit card automatically while maintaining card number without any interruptions [25].	Egypt
AmInvestment & Maybank	Perpetual Sukuk. Received Asia Pacific's Best Islamic Investment Bank 2019 by "The Asset Triple A Islamic Finance Awards"	A RM950 million perpetual senior sukuk mudaraba issue in 2018 by Yinson Holdings Bhd. as the first perpetual sukuk associated with an oil and gas company in Malaysia [26].	Malaysia
CIMB	Collateralized Sukuk	Sukuk backed by a pool of loans. Collateralized sukuk's underlying assets cannot be securitized more than once unlike its conventional counterparts, hence mitigating risks [27].	Malaysia
CIMB	Exchangeable Sukuk 2019. Joint award-most innovative sukuk by Global Finance Magazine	A trust certificate with cash-only settlement that enabled its client to exchange sukuk holdings in China International Trust Investment Corp [28].	Malaysia
HSBC Amanah	UN sukuk (2019). Received Deal of the Year at The Asset Triple A Islamic Finance Awards 2019	World's first sustainable development goals (SDG) sukuk [29].	Malaysia
Bank Islam	Sadaqa House (2018)	Allows contribution from the public be made through the bank's digital crowdfunding for social financing in healthcare and education [30].	Malaysia
Rain	Shari'a compliant cryptocurrency exchange	A Bahrain-based cryptocurrency exchange that is Shariah compliant [31].	Bahrain
Eskan Bank	Islamic REIT	First REIT in Bahrain that also allows foreign investors to participate. Second Shariah compliant REIT in GCC [32].	Bahrain
Bahrain Islamic Bank	BisB Digital	First fully digital branch, created Tejoori Instant Finance to allow instant finance in under 5 min against the current account [33].	Bahrain
Bahrain Islamic Bank	Jood CSR platform	Fintech-based corporate social responsibility platform as part of social innovation [34].	Bahrain
Qatar Islamic Bank	Instant finance	Allows customers to get personal financing through mobile app [28].	Qatar
Al Rajhi Bank	Self-serving kiosk	Customers can use the fingerprint scanning technology embedded in the machines to instantly print a new Visa debit card at any time [35].	Saudi Arabia
Riyad Bank	Banking Robot	Banking robot named "Riyad" which can interact with customers [36].	Saudi Arabia
Noor Bank	Trade Biz Accelerator-Recognized as Islamic Finance Innovator 2019 by Global Finance Magazine	App that allows SMEs discounted services to third party financial products [28].	UAE

2. Innovation, Human Capital & Skill, and Hypotheses

2.1. Innovation

Innovation may be thought of as occurring along a continuum from sustaining to disruptive. The term "disruptive" does not mean that there must be a breakthrough in product development. Rather it refers to the ability of new but poorly resourced firms to challenge incumbent firms that are leading in the market [37,38]. As these new firms gain entry to incumbent firms' markets by exploiting overlooked needs, they eventually force incumbent firms to adapt their products or services. Disruption is also relatively rare, hence not all firms that introduce new products and services are disrupters. For this reason, much of financial innovation is oriented towards incumbent firms' desire to remain leaders in the market by engaging in sustaining innovation. Sustaining innovation builds on an existing product, process, system or feature, and typically requires small changes in consumers' buying behavior. It tends to be incremental because it is about making better products or improving services that help incumbent firms to sustain growth in an existing market or to improve performance. Christensen et al. [39] maintain that incumbent firms may be better off pursuing sustaining innovation in the face of competition from disrupters as they can still outperform their competitors in this way.

Like conventional banks, Islamic banks engage in some level of financial intermediation. But they must also comply with Shariah legal principles prohibiting *riba* (interest), *maysir* (gambling) and *gharar* (excessive uncertainty or speculation). Islamic finance further distinguishes itself as a system that grounds financial exchanges in social rather than purely profit-maximizing goals. Money is viewed as a medium of exchange that has no value in and of itself unless the profit associated with its use is associated with real or physical assets. Financial activities are expected to be backed by assets while buyers and sellers share risks including profit-and-loss sharing. Consequently, most Islamic financial institutions (IFIs) are engaged in sustaining rather than disruptive innovation as their emergence has not forced incumbent conventional banks to adopt their products nor to transform the latter's market (Table 2). Indeed, some IFIs are conventional banks that operate Islamic windows by offering Islamic financial products. The design of many Islamic financial instruments shares similar building blocks with conventional financial engineering in the unbundling of returns and risks. Conceptually, however, product and service development (NPSD) involves a design phase that ensures that financial instruments are Shariah-compliant [40]. In this sense, a distinction between conventional and Islamic finance is that IFIs must minimize Shariah risks associated with interest, gambling and uncertainty, and not just systemic risks that dominate risk management in the conventional sector.

2.2. Human Capital and Skill

Resource-based theory maintains that resources are heterogeneously distributed across firms [41]. Firms earn rents because of distinctive capabilities that enable them to use their resources more effectively. Reconfiguration of firms' resources influences dynamic capability that in turn shapes how firms adapt to innovation opportunities [42,43]. Successful innovation requires creativity and cognitive capability to recognize a technological opportunity, interpret information and formulate inferences about market needs, all of which depend on the ability and knowledge of the firm's workers. In turn, the quality of skill resources influences a firm's absorptive capacity.

Because innovation involves learning and creativity, firms must build dynamic capability consisting of cognitive, social and technical skills to enable the enterprise to survey, assemble and filter information that strengthens absorptive capacity [42–44]. Furthermore, skills that are difficult to imitate enhance the firm's resource base. For Teece [42], skill is an intangible asset that is a valuable resource because specialized skills are not easily acquired or imitated. Collaboration between workers of different skills and knowledge influences the development of new insights that have the potential to modify innovative behavior through application, re-organization or re-combination of knowledge [45]. Yet little is known of the types of skill and expertise that contribute to innovation in the Islamic financial industry. The next section attempts to formulate some hypotheses about this relationship.

2.3. Hypotheses

To ensure that financial instruments are asset-backed rather than interest-bearing, IFIs rely on a Shariah committee that specializes in Shariah jurisprudence. These scholars and advisors determine if a financial instrument is Shariah-compliant and therefore permissible in the market. Many of these scholars are hired in-house by IFIs in Malaysia or they are external consultants in Bahrain. In Malaysia, failure to comply with Shariah law can result in a large fine under the 2013 Islamic Financial Services Act (IFSA). As a dynamic capability, Islamic financial skills are broadly associated with two types of knowledge workers that are part of their firms' intangible asset. The first consists of professionals who are either educated in Islamic economics/finance, or who have gained experience working in the Islamic financial industry. Many of the professionals work as actuarial scientists, financial analysts, advisors, underwriters and risk analysts which are typically found in the conventional financial sector, but they also tend to be knowledgeable in Shariah. The second comprises Shariah scholars and advisors. Shariah advisors are a distinct group of knowledge specialists who usually hold a college degree in Islamic Studies or Islamic Jurisprudence and Law. The role of the two types of expertise in influencing innovation implies that:

Hypothesis 1a (H1a). *Expertise in Islamic finance positively influences Islamic financial innovation.*

Hypothesis 1b (H1b). *Expertise in Shariah law positively influences Islamic financial innovation.*

Deming [46] observes that, despite automation, robots are poor in emulating human social interactions. Yet workers' ability to work in teams, collaborate and co-create ideas, as well as to learn, is a source of innovation and competitive advantage [44]. Socially complex interactions are not easily substituted, and non-imitability constitutes an important competitive advantage under resource-based theory. Collaborative acts as well as the flow of ideas and solving of problems between skilled workers provide the glue to build a productive team. Hence teamwork is valued by management for innovation [47,48]. Conversely, lack of collaboration and communication depresses innovation capability as team members are more distrustful of one another and therefore less likely to achieve a shared understanding [49]. In the context of Islamic financial institutions, social skills are expected to influence the innovation process given the level of interpersonal interactions and communication that need to be in place for a financial product or service to be conceived, developed and approved (by the Shariah committee). Shariah advisors often make judgments as to whether the activities contain *riba*. Social skills help build shared cognition.

Hypothesis 2 (H2). *Social skills positively affect Islamic financial innovation.*

Radical innovation is underscored by abstract concepts that favor mathematical and scientific skills [4]. In conventional finance, complex mathematical and statistical models led to modern financial innovation [50]. Expertise in mathematical finance provided new ideas not only for financial derivatives but also for the use of electronic technology in financial trading [51]. These developments in turn have generated a demand for cognitive skills. Specifically, up-skilling demands skills of risk analysis including an understanding of major financial models [52]. Cognitive and analytical skills associated with deductive, critical reasoning and a high level of mathematical literacy underscore a cadre of experts who perform research and development (R&D). IFIs are no different in this regard and many of this paper's surveyed professional informants hold degrees with specializations in these fields.

But IFIs are also expected to avoid excessive risk and speculative activities under Shariah. This favors technology-related skills particularly those related to computing and ICT-applications that support sustaining innovation. For example, Dunn et al. [53] found that problem-solving that underscores data retrieval in accounting systems does not rely so much on cognitive schemas but on tools that are available to improve cognitive fit. Consequently, we distinguish the cognitive-analytical

skills above from cognitive-technical skills. Philippon and Reshef [54] called more complex analytical tasks "cognitive non-routine", and computational tasks that are more routinized "cognitive routine". The latter are associated with technoscience and a narrower set of skills as they combine service and software technological applications [2,55].

Cognitive-technical skills tend to facilitate problem-solving and are highly relevant for improving service quality in banking [56]. Hilton [55] also points out that advances in ICTs and computers have allowed tasks that were formerly performed by cognitive-analytical workers to be performed by technical programmers. Indeed, it was computer technology that rendered financial services patentable by embedding the service in a physical device [6]. To the extent that many current Islamic financial instruments and products such as Islamic bonds and credit cards involve solving the problem of Shariah risks among conventional products, we expect cognitive-technical skills to play a relevant role in financial innovation. We also expect cognitive-analytical skills to be positive because they are associated with expertise that tackles complex concepts.

Hypothesis 3a (H3a). *Cognitive-technical skills positively influence Islamic financial innovation.*

Hypothesis 3b (H3b). *The effect of cognitive-analytical skills on Islamic financial innovation is positive.*

The marketing literature has long noted the role of marketing personnel in connecting customers to a new product or service, and dissemination of customer values to the product and service development team [57]. Marketing expertise is relevant for upstream product and service development through marketeers' ability to screen customers' needs and anticipate market trends. Gathering of market intelligence as part of marketing research can spur the firm to come up with better designs, features, delivery or solutions to maintain a prevailing market position or to reach a new market segment [58]. Since a critical element of innovation involves new knowledge, customer orientation, which is an important component of marketing management, can contribute to new product development by identifying customers' needs [59].

However, innovation requires a high level of integration between marketing and other departments including product development. If this integration is lacking, the benefits of marketing capabilities may be diminished. Moreover, the relationship between marketing orientation and innovation tends to be stronger when the innovation is exploratory, and returns are uncertain because of a high level of experimentation with customers [60]. This is rarely the case in the financial services industry; lack of open innovation stems from banks' reliance on internal rather than external knowledge sources. Internal sources are associated with in-house management and personnel. The most important external source of knowledge for innovation tends to come from other banks or government rather than customers [61]. As Islamic financial innovation is still at a relatively early stage of development compared to the conventional sector, it has focused on exploiting and extending prevailing financial products that are readily transformed into Shariah-compliant instruments rather than exploring new market ideas that entail a high level of prohibitive risks. Hence it is unclear if marketing skill benefits innovation at this stage of the industry's development.

Hypothesis 4 (H4). *Marketing skill may have positive or negative effects on Islamic financial innovation.*

Product development teams require leadership processes because collaboration involves planning as well as task setting and control [48]. Managing new product development also requires the integration of various functional areas of the product and service development process. Innovation is a social process requiring teamwork and interactions, in this case between workers of different specializations. This includes consulting with members of the Shariah committee in Islamic finance. The task of integration typically falls on the shoulder of the product development team leader because functional unit managers may find the team's networks too complex to control [62]. Shina [63] has pointed out that technical personnel tend to be individualistic and are not necessarily trained in

managerial skills. Innovation is positive when the team leader's managerial skills motivate team members to exploit the informational content of the firm's internal and external networks, thereby stimulating the flow of ideas between people. By acting as "champions" [64], good managers can ensure that product or service development is well-coordinated, and ideas do not die. Managerial competency in coordinating teams facilitates different elements of the innovation process coming together [65].

Hypothesis 5 (H5). *Strong managerial skill of the product and service development team leader favorably influences Islamic financial innovation.*

2.4. Control Variables

Five control variables are introduced in the paper and listed in Appendix A. They are size, foreignness, level of human capital, research and development (R&D) expenditure, and country differences. Larger banks or firms tend to generate more patents; they also tend to have larger R&D expenditure [66]. R&D expenditure has been found to be a determinant of a firm's level of absorptive capacity of knowledge [67] and indicates a bank's propensity to invest in activities that lead to product or service innovation. As for foreignness, Sufian [68] shows that foreign banks are more productive and, by implication, more innovative. However, Miller and Parkhe [69] argue that global banks suffer from the liability of foreignness in host countries. Hence local banks may be more innovative. The level of human capital is a critical capability in service innovation [70]. Hatch & Dyer [71] found that educated workers learn more and they augment a firm's learning activities. Not surprisingly, Philippon and Reshef [54] found a college wage premium for financial workers.

The final variable "country" controls for national differences between Bahrain and Malaysia, for instance, the leading initiative by Malaysia to introduce new, innovative, sometimes controversial products, such as *sukuks* (Islamic bonds), compared to the more conservative practices of Gulf countries.

3. Data and Methodology

A survey instrument was administered to 120 respondents out of 391 contacted individuals (106 for Malaysia, 285 for Bahrain) identified on Linkedin who held management, executive or CEO positions in IFIs in the capital cities of Kuala Lumpur, Malaysia, and Manama, Bahrain. Executives and management not only determine the firm's R&D agenda, but they also make decisions on the hiring of skilled personnel, including the makeup of the product development team [72]. For this reason, the questionnaire solicits top executives' assessment of the skills that are relevant to their firms' financial innovation. IFIs comprise Islamic banks, Islamic windows and *Takaful* (insurance) companies. The sample represents about 25% of the IFF management population and was compiled using several sources. These include the two countries' Central Banks, professional and industry associations, and *The Banker* [73]. Respondents' positions, titles and education were also verified through Internet searches, and in particular through Linkedin.com where respondents who were surveyed had detailed their biographies, specializations and skills. Respondents were contacted by email, Linkedin, and Whatsapp between 2014 and early 2016. The survey instrument was administered on SurveyMonkey. In addition, the authors followed up the survey with 20 interviews which began in 2015 and lasted until 2017. The main reason for this length of time was that the fieldwork commenced not long after Malaysian Airlines flight MH370 was reported missing and the 1MDB (Malaysian Development Berhad) scandal involving possible illicit finance by Malaysia's former Prime Minister came to light. Respondents avoided interviews, but the authors successfully resumed these in the middle of 2016. More recently in 2020, the authors re-interviewed seven respondents to triangulate the findings.

Fifty-five percent of the respondents are located in Manama and the rest in Kuala Lumpur. About 30% are foreign IFFs including Citibank, HSBC and banks from Saudi Arabia, Dubai, Pakistan and other Gulf countries. Non-response bias was tested following Armstrong and Overton's [74]

procedure. No significant differences may be found for IFI type ($p = 0.11$), size ($p = 0.25$), foreignness ($p = 0.77$), and level of innovation ($p = 0.34$) indicating lack of support for response bias.

For the dependent innovation variable, IFI executives were asked to indicate the number of new financial products, instruments and/or services introduced in the past five years (see Lee et al. [66] who also used a similar measure). The survey followed up this question with a qualitative question seeking description of innovation products and services. The descriptions roughly aligned with the categories checked by the respondents. Hence a respondent who checked category "3–4" also described four products and services. Examples include the Islamic credit card which does not charge interest but is fee-based, or a sale-and-repurchase *Murabahah* credit card.

Executives were also asked to rate the importance of various skills and expertise to financial innovation, from 1 (highly unimportant) to 6 (highly important). Each of the three skill constructs, i.e., cognitive-analytical, cognitive-technical and social skills, are measured by multiple items as shown in Appendix A. Cognitive-analytical, for example, is the average of three skill items: mathematics and statistics, deductive and analytical, and, critical thinking. The alpha Cronbach is 0.72 for social skill, 0.75 for cognitive-analytical and 0.68 for cognitive-technical which is close to 0.7.

Rammstedt and Belerlein [75]) suggests that short-scale surveys which consist of few items perconstruct tend to result in low alpha Cronbach estimates but point out that they are popular because they reduce redundancy.

Rationale for the above skill items is drawn from previous literature including Michie and Sheehan [47], Freel [76], Deming [46] and Wang et al. [77], who highlighted the role of teamwork, marketing, managerial and social skills. They are also collated from the *World Economic Forum Report* [78] that lists cognitive, social and managerial as three of the most relevant skills. Finally, the U.S. Department of Labor's Occupation Information Network database (O*NET) has compiled a list of skills for many professions. Each profession's skills are scored from 0 to 100. For instance, a risk management professional scores highly (over 65) for skills of "critical thinking", "complex problem-solving" and "mathematics". Based on O*NET skill scores for financial professions, we were able to identify the taxonomy of skills listed in Appendix A.

Harmon's single factor test was used to check for common method bias [79]. This bias is said to arise if all of the items loaded on one factor or if the first factor explains a high proportion of the variance. Factor analysis generated five main factors that explain 82% of the variance, with the first factor accounting for 27% of the variance. The constructs' items also have reasonable loadings (Appendix B) and they are classified in separate factors suggesting that common method bias is not present.

4. Findings and Results

Summary statistics are provided in Table 3 for categorical and continuous data. The table shows that, except for cognitive-technical, all other skills have a median of 5.0 and above out of a maximum of 6. Interquartile range varies between 1 to 2. At least half of IFIs' employees have expertise in Islamic finance and nearly 75% of these employees hold a college and higher degree. The categorical variable R&D expenditure's median is 4.5 which translates into 9–12% (IQR is 2 (0.5–2%) to 6 (12–15%)). This is consistent with or even higher than the figures provided by Toner [80] who shows that R&D expenditure of the finance and insurance industry in OECD countries is around 9.2%.

Table 3. Descriptive Statistics.

	Mean	SD	Median	Min	Max	IQR
Control variable						
Size (%)	52.4	37.1	50	0	100	20–80
College Degree and above (%)	74.7	30.8	90	1	100	50–90
R&D expenditure * (%)	9–12	-	-	-	-	-
Foreignness* (% foreign)	30	-	-	-	-	-
Country (1 = Bahrain, 2 = Malaysia)	-	-	-	-	-	-
Skill						
Cognitive-Analytical	5	0.8	5	2	6	4.5–5.5
Cognitive-Technical	4.4	0.9	4.4	1	6	4.0–5.0
Social	5.3	0.7	5.4	3.5	6	5.0–6.0
Marketing	4.8	1.1	4.8	1	6	4.0–6.0
Managerial	5	0.8	5	1	6	4.5–6.0
Expertise in Islamic finance & Accounting	5.3	0.9	6	1	6	5.0–6.0
Expertise in Shariah law	5.2	1	6	1	6	5.0–6.0

* Categorical variables; IQR denotes interquartile range.

Table 4 shows the inter-correlations among the independent variables. Using the cutoff point of 0.70 [81], most of the correlations are low except for cognitive-technical and cognitive-analytical. Tests of collinearity show that the highest VIF is 3.79 which is below the recommended threshold of 5 [82]. To examine the hypotheses, we specify the innovation regression function as:

$$I_i = \alpha_0 + S_i\beta + CV_i\delta + \varepsilon_i \quad (1)$$

where I_i is the number of new products or services introduced in the past five years as described in Appendix A, α_0 is the constant term, S_i is a matrix of skill variables, and CV_i are the control variables described previously. Age was considered as a control variable but was dropped because of a lack of variation since many IFIs were established only recently.

Table 5 presents the Ordinary Least Squares (OLS) regression results including standardized estimated coefficients. Two sets of regressions are reported. The first is the base model without the skill factors. Here, only R&D expenditure is significant, but at 10%. This confirms prevailing literature that priority in R&D, through high expenditure, influences innovation. When skills are added to the base in the full model, the results are as follows. First, of the control variables, size is significant but only marginally and its effect is negligible. The standardized regression model confirms its relatively low beta weight. R&D expenditure is no longer significant. Second, H1a is supported, as expertise in Islamic finance is significant at 5%, but not H1b, since expertise in Shariah law is negative. Being proficient in Islamic finance matters, because Islamic financial products are not free from considerations of conventional systemic risks. However, while the conventional sector involves an interest system, transactions between clients and IFIs rely on the sharing of risks. In the latter, the IFI is offered a role by funding the entrepreneur's project in return for a share of the profit under profit-and-loss sharing [83]. Understanding this difference is important for innovation since profit earned is understood to be compensation and not the redemption of debt, which is prohibited.

Pearson's correlation is expressed as:

$$r = n(\sum xy) - (\sum x)(\sum y)/\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]} \quad (2)$$

Note: Informants and their firms' identities are protected under Institutional Review Board (ethics board) guidelines and will remain anonymous in this paper.

Table 4. Correlation Matrix.

		1	2	3	4	5	6	7	8	9	10	11	12
1.	Cognitive-Analytical	1											
2.	Cognitive-Technical	0.71 **	1.00										
3.	Social	0.40 **	0.32 **	1.00									
4.	Marketing	0.22 **	0.42 **	0.45 **	1.00								
5.	Managerial	0.32 **	0.37 **	0.60 **	0.47 **	1.00							
6.	Islamic finance expertise	0.28 **	0.31 **	0.32 **	0.34 **	0.44 **	1.00						
7.	Shariah law expertise	0.26 **	0.28 **	0.28 **	0.17	0.45 **	0.79 **	1.00					
8.	Size	0.18	0.16	0.01	0.03	0.02	−0.16	−0.19 **	1.00				
9.	College Degree and above	−0.06	−0.15	−0.03	−0.10	−0.08	−0.20 **	−0.28 **	0.26 **	1.00			
10.	R&D Expenditure	0.21 **	0.25 **	−0.05	−0.02	−0.06	0.08	0.12	0.40 **	0.11	1.00		
11.	Foreignness	0.03	0.05	−0.13	−0.01	−0.07	0.00	−0.06	0.04	−0.22	0.04	1.00	
12.	Country	0.09	−0.03	0.08	−0.02	−0.11	−0.17 **	−0.14	−0.05	−0.09	0.09	0.20 **	1.00

$N = 120$; ** $p < 0.05$.

Contrary to expectation, Shariah expertise is negative although the significance level is marginal at 10%. One possible explanation is that ideas for a new product tend to emerge from the more technically-oriented Islamic financial workers rather than Shariah experts. The literature suggests that the financial service industry is becoming more data-intensive and automated which calls for more expertise in more routinized forms of cognitive work. This includes the computerization of functions and tasks and management of digital tools [84]. The Shariah advisor's role, on the other hand, is to advise the board of directors and management to ensure that policies and procedures adhere to Shariah, and to endorse new products [85]. In a 2020 interview, the head of an innovation department of a bank in Bahrain expressed the following: "the typical response I see [from a Shariah advisor] is create the product, show me the finalized process and I will have my review and comment back". He described the role of a Shariah expert as a "guardian", which excludes product development work. The chief manager of a Bahraini banking group's Shariah Audit confirmed recently that Shariah advisors are "not technically involved in product structuring" in his bank. Other interviews with executives indicate that the product and service development team tend to consist of specialists whose primary university degrees are in Islamic finance, economics, or statistics. But they are also Shariah-knowledgeable. Many hold a certificate in Islamic jurisprudence or are sent to workshops for training on Shariah principles. A respondent who graduated in conventional finance but went on to be certified in Shariah said:

> *This is possible because we have highly trained staff. Because of that, the [Shariah] committee doesn't have to focus on the nitty-gritty issues or some basic flaws. So, this helps with the new product turnaround, making our work easier.*

One Shariah advisor from Bahrain further explained that experts like himself tend to be hired as external consultants. Shariah advisors' lack of integration in product development adversely affects innovation outcomes.

Third, the table shows that social skill is not significant, hence H2 is not supported. While innovation is a social process involving collaboration between individuals in a team, the social factor is an inimitable firm resource only if complex interactions enable rather than inhibit idea and information access. That it is not significant highlights three possible explanations. First, Janssen et al. [86] suggest that workers with innovative ideas are likely to face conflicts and resistance from other workers who have an interest in protecting prevailing operational structures and work methods. Coordination between members is needed to develop, discuss, modify and implement ideas. This could lead to changes that trigger conflicts so that complex relationships become a liability rather than an asset. Second, and this is perhaps the more plausible explanation. Obstfeld [87] argues that, when social networks are too dense or local, there are fewer opportunities for new social connections. This inhibits socially complex interactions that lead to combination and re-combination of ideas for innovation [88]. One piece of evidence that would seem to support the above argument is that less than 15% of the IFIs' human resources are hired from outside of the two countries suggesting that human capital is relatively local. Another explanation relates to the quality of social interactions. Creative ideas are more likely to emerge from diverging knowledge. Teamwork may encourage knowledge convergence and conformity which impede the development of new ideas [48].

Next, cognitive-technical innovation is positive and significant supporting H3a. But cognitive analytical-innovation is marginally negative at 10%. Doran and Ryan [4] show that analytical skill is more likely to influence radical products. This could be the case here given the sustaining nature of Islamic financial innovation. One informant whose Bahraini-based bank is rated as one of the world's best IFI by The Asian Banker in 2019 pointed out in a recent interview that:

> *Since the subprime/GFC crisis, people are wary of complicated models. The global financial crisis showed the falsehood of complicated models/investment products. Most models have underlying assumptions which may not be realistic.*

Table 5. Ordinary Least Squares (OLS) regression analysis for innovation and skills.

Variables	Basic Model	Standardized Model	Full Model	Standardized Model
Size	0.00 (0.00)	0.15	0.01 * (0.00)	0.18
College Degree and above	−0.00 (0.00)	−0.05	−0.00 (0.00)	−0.05
R&D expenditure	0.13 * (0.07)	0.19	0.09 (0.07)	0.14
Foreignness	−0.44 (0.41)	−0.10	−0.61 (0.43)	−0.14
Country	−0.10 (0.30)	−0.04	0.08 (0.31)	0.03
Skill				
Cognitive-Analytical			−0.68 * (0.36)	−0.29
Cognitive-Technical			0.82 ** (0.32)	0.39
Social			0.29 (0.41)	0.09
Marketing			−0.75 ** (0.21)	−0.46
Managerial			0.15 (0.28)	0.07
Expertise in Islamic finance			0.76 ** (0.37)	0.38
Expertise in Shariah law			−0.63 * (0.34)	−0.33
Adj R2	0.05		0.15	
F	1.87		2.01	

Note: * p <0.10; ** p < 0.05; standard errors are in parentheses.

Wariness of analytical modeling stems from the concern that complex models do not capture "religious intent". As the head of credit risk of a large banking group in Bahrain observed, most Islamic banks steer away from developing radical products because, if they are too different from conventional products, "no board of directors would approve that". In other words, even if a new product is Shariah compliant, systemic risks could still be too high for approval by the board of directors. IF financial innovation thus involves balancing between the two forms of risk. This does not mean that sustaining innovation precludes radical innovation as Christensen et al. [39] have theorized. The above informant offered the *salam* commodity trade structure as an example of radical innovation because it enables the buyer to use advance payment to develop real assets, in this case to build a factory.

Cognitive-technical skills on the other hand positively influence financial innovation for a number of reasons. Market conditions and technology are known equally to firms engaged in sustaining forms of innovation [64]. Problems are fairly structured and many tasks are performed by technology such as the computer [89]. Shiller [6] points out that business transactions were deemed unpatentable until the 1980s. The courts required proof of physical outcomes such as an engineering device. When computer technology enabled financial transactions to be performed efficiently, this finally met the condition for patentability. It is worth noting that quite a few innovations in Table 2 are associated with electronic and digital technology. This helps explain the relevance of cognitive-technical skills. Technical and applied

skills are associated with knowledge of certain tools or processes. Tasks that are computerized and automated tend to be those that lend themselves to a set of rules and logical structure [90]. IFIs have been actively adopting technology to collect digital information, manage risk and engage in financial engineering. Post-survey interviews indicate that IFIs rely on skilled workers who are familiar with software programs to perform pricing, risk and loss modeling. One Takaful firm specializing in flood insurance, for instance, developed its own program to simulate various scenarios of catastrophes, from floods to storms and typhoons. New products are developed from such simulations. The same IFI's products and services are also available on the Internet. Online offerings in turn enable the IFI to collect digital data which is analyzed and then re-designed as part of the innovation process. The Malaysian informant, a Vice-President with a university degree in statistics as well as Islamic finance, highlighted that:

> *The program definitely helps in our innovation process because it helps you see what your risk exposures are. We cannot develop products if we cannot computerize what our risk exposures are.*

The above IFI is also introducing automobile insurance products that cover the buyer only when the individual drives a car on the road. This innovation is possible because of a team of programmers who had spent a considerable amount of time processing "big data". Notably, the informant emphasizes that "analytical skills have been overtaken by a computer". This case helps to illuminate why cognitive-technical skill is positive and highly significant, namely that cognitive capability involves applying formulaic routines. As noted previously, Shariah ethics require that the IFI share not just profits but losses too. The large number of variables that need to be considered calls for expertise in computational capability. Another informant, the vice-president of a bank with Shariah credentials in Malaysia, noted that:

> *In Islamic finance, the contract is not loan-based but a joint-venture basis. The set of risks is different. If you finance a building with a contractor, in Islamic finance, you are partially the owner of that construction as well. So, if anything happens with the building, you are also responsible for it.*

Finally, Table 5 shows that marketing skill is negative, and managerial skill is not significant, supporting neither H4 nor H5. Schueffel and Vadana [61] suggest that financial firms' innovation potential is better harnessed from front office personnel who are already in regular contact with customers. As banks are less interested in open innovation, they rely on internal resources or closed innovation as the most important source of knowledge for innovation. Closed innovation prioritizes boards of directors, frontline employees and the NPSD team, all of which do not involve marketing [87]. While they sometimes turn to external sources of knowledge, these tend to be other banks and government institutions. Post-survey IFI interviews support the observation that internal sources may play a more important role, for example, the idea of re-branding Islamic financial products as ethical products to non-Muslim customers in Malaysia.

Furthermore, Stock and Reiferscheid [91] show that marketing personnel tend to lack power compared to their more technical R&D counterparts. One manager insisted that his marketing personnel only have a "basic understanding of the banking process". Hence the product development team of his bank is composed of "people from legal background, financial engineering, economists" rather than marketing personnel. Schueffel and Vadana's [61] review of financial services innovation shows that only a few lead clients can play a role because they tend to have the strongest need for new products or services. Poor integration between product development and marketing departments also means that the NPSD team rarely interacts with lead clients.

The non-significance of managerial skill is more difficult to explain. One clue may be provided in an online forum conducted by Professor Jim Heskett of Harvard University seeking leading companies' views on the role of management in innovation (http://hbswk.hbs.edu/item/what-is-managements-role-in-innovation). Innovation requires risk-taking behavior. NPSD leaders' aptitude for risk-taking may be diminished by prevailing management models that discourage failure [92]. Managing and

supervising a team includes capability in financial evaluation, reasonable estimation of the costs of product and service development, and the ability to prioritize various projects [76]. NPSD management is associated with leadership in coordination and communication across units, and the gathering of knowledge from different specializations. In addition, conflict among top management can affect innovation. For example, Wang et al. [77] show that affective conflicts between management personnel in the sales and marketing departments inhibit the implementation of innovation. Together with social skills, which is also not significant, this may indicate potentially weak team processes and leadership in planning and control of NPSD, but the weakness could also be organizational and cultural. Hofstede's cultural dimensions rank Malaysia and Gulf countries highly for power distance. High power distance suggests a more centralized form of management of NPSD that may not be conducive to the sharing of information or promotion of new ideas [93].

Standardized regressions indicate that cognitive-technical and expertise in Islamic finance are relatively similar in terms of their beta weight on innovation. This resonates with the paper's overall thrust that Islamic financial innovation is sustaining than disruptive. In a 2020 interview with an informant specializing in private equity, he summed up the significance of these two skills as follows:

> *You definitely need a programming and software background because you need to develop platforms for Islamic financial transactions. But if you are talking about product development, then you definitely need experience in structuring products and an Islamic finance background.*

Marketing's negative effect is the highest. A few respondents explained that developing a new product or service requires knowledge of the underlying financial structure, hence marketing skills are not important compared to expertise in Islamic finance. Some studies, however, suggest that increasing marketing workers' power and role in R&D can enhance innovation [58,91]. Marketing's role could also be more positive if IFIs balance closed and open innovation, expanding knowledge sources beyond their in-house personnel and other banks, to customers [94]. Finally, it is worth pointing out that the findings reinforce the industry's reliance on sustaining forms of innovation because: (i) this predominantly targets prevailing markets rather than displacing industry leaders, and (ii) there is aversion to high credit or market risks, shaped in part by Shariah ideals of social goals.

5. Discussion and Conclusions

Human capital is a relevant component of the resource base of a firm through its influence on firm's innovative performance. How skills are managed, therefore, affects the innovative capacity of IFIs. In examining the types of skill that contribute to higher innovation level among Islamic financial firms, the results highlight the following.

Professionals who are credentialed in Islamic finance positively influence IF innovation. These professionals' skill in combining knowledge associated with conventional systemic risks as well as Shariah risks is particularly important in the structuring of new products. Many of the ideas driving innovation may have come from conventional finance, but specialists in Islamic finance reinforce credibility by ensuring that the product minimizes interest, gambling and excessive speculation. Professionals who are proficient in Islamic finance help transform financial products into risk-sharing instruments that are asset-based. Next, the need to minimize Shariah risks means that innovation tends to be sustaining. IF innovation is unlikely to be radical compared to the recent history of the conventional sector where highly risky instruments such as credit default swaps led to more radical innovation [66]. Whereas some of the most important modern conventional financial innovations such as debt securities have relied on cognitive-analytical expertise in mathematics and statistics, the sustaining nature of IF innovation favors the cognitive-technical skills of programming and data-analysis. Cognitive-analytical skill adversely affects IF innovation compared to conventional finance, it would seem, because excessive market and credit risks are frowned upon in Shariah. One implication is that shortage of technical personnel in the industry will need to be addressed

given the positive role of cognitive-technical skills in IF innovation. For example, Malaysian banks are considering various educational schemes that can help their employees upgrade their skills.

In addition, marketing skill has a negative effect on IFI innovation. Customers are not yet an important source of innovation. This skill tends to be associated much more with product sales than product development. Part of the reason may be that IFIs are still developing dynamic capability and inimitable knowledge resources. As dynamic capability strengthens, IFIs could be encouraged to balance closed innovation with open innovation through sourcing of external knowledge from customers.

Finally, some limitations of the research should be mentioned. First, it is unclear if the negative finding for marketing extends to the conventional sector where innovation is more open and customers are an important source of knowledge for product and service development. More work will need to be done here. Second, Bahrain has taken steps to become a financial technology (fintech) hub recently. The paper did not examine fintech per se although a few of the surveyed respondents had worked in the industry. This is an important topic that deserves further attention. Finally, while the interviews are relatively recent, the survey data is older. Nonetheless, the findings should remain relevant because as one informant has pointed out: "Expertise in Islamic finance and the technical are valid today as five years ago".

Author Contributions: Lead author: J.P.—Formal analysis, writing, methodology, supervision, validation, funding acquisition. Second: Y.W.C.—Data Curation, investigation, project administration, review, visualization, resources. Third: M.E.—Data Curation, investigation, resources, review, visualization, resources. R.R.—Data Curation, resources. All authors have read and agreed to the published version of the manuscript.

Funding: Funding for this research was provided by the National Science Foundation (NSF) grant # 1261805.

Acknowledgments: We thank Delil Khairat, Obiyathulla Bacha, and Md. Som bin Sujimon for their time and engagement of discussions that have shed light on the Islamic financial industry.

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

Appendix A

Table A1. Variables and Measurements.

Variable	Measurement
Dependent variable	Number of new products/services introduced in the past 5 years
Control variable	
Firm size	Number of Islamic financial employees
Human capital level	Share (%) of employees with college and above degree
R&D expenditure	Share (%) of Islamic financial R&D to total expenditure
Foreignness	Binary (if firm is domestic or foreign)
Country	Binary (if firm is from Bahrain or Malaysia)
Skill	
Cognitive-analytical	Mean scores of: (i) mathematics and statistics, (ii) deductive and analytical thinking, (iii) critical thinking
Cognitive-technical	Mean scores of: (i) computer or software programming, (ii) technical skill, (iii) problem-solving
Social	Mean scores of: (i) written communication, (ii) verbal communication, (ii) interpersonal interactions
Marketing	Marketing skill
Managerial	Management skill
Expertise in Islamic finance and accounting	Competency in Islamic finance and accounting
Expertise in Shariah law	Proficiency in Shariah law

Note: Skill items are based on survey questions asking respondents to rank the importance of the listed skills to new product/service development (1 = highly unimportant, 6 = highly important).

Appendix B

Table A2. Factor loadings and Common Method Bias.

Skill Item	Factor Loading
Mathematics and statistics	0.49
Critical thinking	0.62
Analytical thinking	0.89
Computer or software programming	0.50
Problem-solving	0.64
Marketing	0.93
Verbal communication	0.86
Interpersonal interactions	0.67
Formal or informal teamwork	0.53
Managerial capability of team-leader	0.49
Expertise in Islamic finance	0.71
Expertise in Shariah	0.91

References

1. Lenihan, H.; McGuirk, H.; Murphy, K.R. Driving innovation: Public policy and human capital. *Res. Pol.* **2019**, *48*, 103791. [CrossRef]
2. Górka, S.; Hardy, W.; Keister, R.; Lewandowski, P. Tasks and Skills in European Labor Markets. *Backgr. Pap. Grow. United IBS Res. Rep.* **2017**, *3*, 2017.
3. Messinis, G.; Ahmed, A.D. Cognitive skills, innovation and technology diffusion. *Econ. Model.* **2013**, *30*, 565–578. [CrossRef]
4. Doran, J.; Ryan, G. Firms' skills as drivers of radical and incremental innovation. *Econ. Lett.* **2014**, *125*, 107–109. [CrossRef]
5. Shiller, R.J. *The New Financial Order: Risk in the 21st Century*; Princeton University Press: Princeton, NJ, USA, 2003.
6. Shiller, R.J. *The Subprime Solution: How Today's Global Financial Crisis Happened, and What to Do about it*; Princeton University Press: Princeton, NJ, USA, 2012.
7. Poitras, G. *Risk Management, Speculation, and Derivative Securities*; Academic Press: San Diego, CA, USA, 2002.
8. Kolb, R.W.; Overdahl, J.A. *Financial Derivatives: Pricing and Risk Management*; John Wiley: New York, NY, USA, 2009.
9. Sekreter, A. Sharing of risks in Islamic finance. *IBSU Sci. J.* **2011**, *5*, 13–20.
10. Dill, A. *Bank Regulation, Risk Management, and Compliance: Theory, Practice, and Key Problem Areas*; Rourledge: New York, NY, USA, 2019.
11. Sinclair, T.J. Institutional failures and the global financial crisis. In *The Consequence of Global Financial Crisis*; Grant, W., Wilson, G.K., Eds.; Oxford University Press: Oxford, UK, 2012; pp. 139–155.
12. Khan, F. *Islamic Banking in Pakistan: Shariah-Compliant Finance and the Quest to Make Pakistan More Islamic*; Routledge: London, UK, 2015.
13. NextFinance. State Street Global Advisors Launches First Infrastructure ETF to Offer Combined Exposure to Equities and Bonds. Available online: https://www.next-finance.net/State-Street-Global-Advisors,7301 (accessed on 16 June 2020).
14. Citigroup. Citi Wins Top Awards for Innovation in Structured Products. Available online: https://www.citigroup.com/citi/news/2019/190304a.htm (accessed on 16 June 2020).
15. Bank of America. Bank of America Issues Fifth Corporate Green Bond for $2 Billion. Available online: https://newsroom.bankofamerica.com/press-releases/environment/bank-america-issues-fifth-corporate-green-bond-2-billion (accessed on 16 June 2020).
16. Goldman Sachs. Summary Prospectus: Goldman Sachs Access High Yield Corporate Bond ETF. Available online: https://www.sec.gov/Archives/edgar/data/1479026/000119312517289113/d447185d497k.htm (accessed on 16 June 2020).

17. InvestmentNews. Structured Notes Offer too-Good-to-be True Returns. Available online: https://www.investmentnews.com/structured-notes-offer-too-good-to-be-true-returns-49420 (accessed on 16 June 2020).
18. DBS. How DBS Bank's KAI Banking Chatbot is Setting a New Benchmark in Customer Service. Available online: https://www.dbs.com/lm/how-dbs-banks-kat-banking-chatbot-is-setting-a-new-benchmark-in-customer-service.html (accessed on 16 June 2020).
19. Morgan, J.P. Chase Connect. Available online: https://www.jpmorgan.com/commercial-banking/innovation (accessed on 16 June 2020).
20. CB Insights. 37 Corporate Innovation Labs in Finance. Available online: https://www.cbinsights.com/research/report/finance-corporate-innovation-labs/ (accessed on 16 June 2020).
21. Goldman Sachs. Bringing Innovative Financial Solutions to Consumers. Available online: https://www.goldmansachs.com/careers/possibilities/marcus-by-gs.html (accessed on 16 June 2020).
22. Business Wire. Wells Fargo Announces a Mobile-First Banking Experience to Encourage Financial Health. Available online: https://www.businesswire.com/news/home/20171102006020/en/Wells-Fargo-Announces-Mobile-First-Banking-Experience-Encourage (accessed on 16 June 2020).
23. Business Wire. Blockchain Technology Backed Home Remittances from Malaysia to Pakistan Made Possible to Promote Financial Inclusion. Available online: https://www.businesswire.com/news/home/20190108005651/en/Blockchain-Technology-Backed-Home-Remittances-Malaysia-Pakistan (accessed on 16 June 2020).
24. Lloyds Bank. Lloyds Bank Launches Global Gateway to International Trade. Available online: https://www.lloydsbankinggroup.com/media/press-releases/2016-press-releases/lloyds-bank/lloyds-launches-international-trade-portal/ (accessed on 16 June 2020).
25. Global Finance Magazine. Press Release: Global Finance Names the Innovators. 2019. Available online: https://d2tyltutevw8th.cloudfront.net/media/document/press-release-the-innovators-2019-1557508186.pdf (accessed on 15 June 2020).
26. The Edge Markets Malaysia. Best Non-IPO Fundraising (Sukuk/Bond). Available online: https://www.theedgemarkets.com/article/best-nonipo-fundraising-sukukbond-yinsons-rm950-mil-perpetual-sukuk-first-oil-and-gas (accessed on 15 June 2020).
27. The Edge Markets Malaysia. Islamic Asset Pool Widens with CIMB's First Collateralised Sukuk. Available online: https://www.theedgemarkets.com/article/islamic-asset-pool-widens-cimb%E2%80%99s-first-collateralised-sukuk (accessed on 15 June 2020).
28. Global Finance Magazine. The Innovators. 2019. Available online: https://www.gfmag.com/magazine/june-2019/innovators-2019-islamic-finance (accessed on 16 June 2020).
29. United Nations Development Programme. HSBC Amanah Malaysia Issues World's First SDG Sukuk. Available online: https://www.undp.org/content/undp/en/home/news-centre/news/2018/HSBC_Amanah_Malaysia_issues_worlds_first_United_Nations_Sustainable_Development_Goals_sukuk.html (accessed on 16 June 2020).
30. The Edge Markets Malaysia. Bank Islam Unveils New App for Sadaqa House Donation. Available online: Hhttps://www.theedgemarkets.com/article/bank-islam-unveils-new-app-sadaqa-house-donation (accessed on 15 June 2020).
31. Startup Bahrain. Bahrain-Based Rain Becomes the First Shari'a-Compliant Crypto Exchange in the Region. Available online: https://startupbahrain.com/news/bahrain-based-rain-becomes-the-first-sharia-compliant-crypto-exchange-in-the-region/ (accessed on 16 June 2020).
32. Gulf News. The Growth of Islamic REITs. Available online: https://gulfnews.com/business/property/the-growth-of-islamic-reits-1.2107758 (accessed on 16 June 2020).
33. BisB. BisB Launches First Fully Fledged Digital Branch in Bahrain. Available online: https://www.bisb.com/en/bisb-launches-first-fully-fledged-digital-branch-bahrain (accessed on 16 June 2020).
34. BisB. BisB Celebrates its 40th Year Anniversary with Launching the Exclusive #BisB Event. Available online: https://www.bisb.com/en/bisb-celebrates-its-40th-year-anniversary-launching-exclusive-bisb-event (accessed on 16 June 2020).
35. Al Rahji Bank. Al Rajhi Bank Introduces the Fingerprint Technology to Print the Cards for its Customers. Available online: https://www.alrajhibank.com.sa/en/alrajhi-group/media-center/press-releases/A-New-Leading-Step-in-the-Customer-Service-Field (accessed on 16 June 2020).

36. Riyad Bank. Riyad Bank Launches the First Banking Robot in the 7th ArabNet Forum Riyadh. Available online: https://www.riyadbank.com/en/information/media-centre/press-releases/2018/17-12-2018 (accessed on 16 June 2020).
37. Christenson, C.; Raynor, M. *The Innovator's Solution: Creating and Sustaining Successful Growth*; Harvard Business Review Press: Brighton, MA, USA, 2003.
38. King, B.G.; Pearce, N.A. The contentiousness of markets: Politics, social movements, and institutional change in markets. *Annu. Rev. Sociol.* **2010**, *36*, 249–267. [CrossRef]
39. Christensen, C.M.; Raynor, M.E.; McDonald, R. What is disruptive innovation. *Harv. Bus. Rev.* **2015**, *93*, 44–53.
40. Alamad, S. *Financial Innovation and Engineering in Islamic Finance*; Springer International Publishing: Cham, Switzerland, 2017.
41. Barney, J. Firm resources and sustained competitive advantage. *J. Manag.* **1991**, *17*, 99–120. [CrossRef]
42. Teece, D.J. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strateg. Manag. J.* **2007**, *28*, 1319–1350. [CrossRef]
43. Teece, D.J. Dynamic capabilities as (workable) management systems theory. *J. Manag. Organ.* **2018**, *24*, 359–368. [CrossRef]
44. Mahoney, J.T.; Kor, Y.Y. Advancing the human capital perspective on value creation by joining capabilities and governance approaches. *Acad. Manag. Perspect.* **2015**, *29*, 296–308. [CrossRef]
45. Hult, G.T.T.; Hurley, R.F.; Knight, G.A. Innovativeness: Its antecedents and impact on business performance. *Ind. Mark. Manag.* **2004**, *33*, 429–438. [CrossRef]
46. Deming, D. The growing importance of social skills in the labor market. *Q. J. Econ.* **2017**, *132*, 1593–1640. [CrossRef]
47. Michie, J.; Sheehan, M. HRM practices, R&D expenditure and innovative investment: Evidence from the UK's 1990 workplace industrial relations survey (WIRS). *Ind. Corp. Chang.* **1999**, *8*, 211–234.
48. Hoegl, M.; Parboteeah, K.P. Creativity in innovative projects: How teamwork matters. *J. Eng. Technol. Manag.* **2007**, *24*, 148–166. [CrossRef]
49. Banaeianjahromi, N.; Smolander, K. Lack of communication and collaboration in enterprise architecture development. *Inf. Syst. Front.* **2019**, *21*, 877–908. [CrossRef]
50. Haliassos, M. *Financial Innovation: Too Much or Too Little*; MIT Press: Cambridge, MA, USA, 2013.
51. Shiller, R.J. From Efficient Markets Theory to Behavioral Finance. *J. Econ. Perspect.* **2003**, *17*, 83–104. [CrossRef]
52. Allen, F.; Yago, G.; Barth, J. *Financial Innovation Collections*; Pearsons: Upper Saddle River, NJ, USA, 2012.
53. Dunn, C.L.; Gerard, G.J.; Grabski, S.V. The combined effects of user schemas and degree of cognitive fit on data retrieval performance. *Int. J. Account. Inf. Syst.* **2017**, *26*, 46–67. [CrossRef]
54. Philippon, T.; Reshef, A. Wages and human capital in the US finance industry: 1909–2006. *Q. J. Econ.* **2012**, *127*, 1551–1609. [CrossRef]
55. Hilton, M. Skills for work in the 21st century: What does the research tell us? *Acad. Manag. Perspect.* **2008**, *22*, 63–78. [CrossRef]
56. Ferreira, F.A.; Jalali, M.S.; Ferreira, J.J.; Stankevičienė, J.; Marques, C.S. Understanding the dynamics behind bank branch service quality in Portugal: Pursuing a holistic view using fuzzy cognitive mapping. *Serv. Bus.* **2016**, *10*, 469–487. [CrossRef]
57. Moorman, C.; Rust, R.T. The role of marketing. *J. Mark.* **1999**, *63*, 180–197. [CrossRef]
58. Efrat, K.; Gilboa, S.; Yonatany, M. When marketing and innovation interact: The case of born-global firms. *Int. Bus. Rev.* **2017**, *26*, 380–390. [CrossRef]
59. Adams, P.; Freitas, I.M.B.; Fontana, R. Strategic orientation, innovation performance and the moderating influence of marketing management. *J. Bus. Res.* **2019**, *97*, 129–140. [CrossRef]
60. Lee, R.; Lee, J.-H.; Garrett, T.C. Synergy effects of innovation on firm performance. *J. Bus. Res.* **2019**, *99*, 507–515. [CrossRef]
61. Schueffel, P.E.; Vadana, I.-I. Open Innovation in the Financial Services Sector-A global literature review. *J. Innov. Manag.* **2015**, *3*, 25–48. [CrossRef]
62. Paashuis, V. *The Organisation of Integrated Product Development*; Springer-Verlag: London, UK, 2013.
63. Shina, S.G. *Successful Implementation of Concurrent Engineering Products and Processes*; John Wiley & Sons: New York, NY, USA, 1993.

64. Holahan, P.J.; Sullivan, Z.Z.; Markham, S.K. Product development as core competence: How formal product development practices differ for radical, more innovative, and incremental product innovations. *J. Prod. Innov. Manag.* **2014**, *31*, 329–345. [CrossRef]
65. Sousa, M.J.; Rocha, Á. Skills for disruptive digital business. *J. Bus. Res.* **2019**, *94*, 257–263. [CrossRef]
66. Chang, X.; Fu, K.; Low, A.; Zhang, W. Non-executive employee stock options and corporate innovation. *J. Finan. Econ.* **2015**, *115*, 168–188. [CrossRef]
67. Lee, C.-Y.; Wu, H.-L.; Pao, H.-W. How does R&D intensity influence firm explorativeness? Evidence of R&D active firms in four advanced countries. *Technovation* **2014**, *34*, 582–593.
68. Sufian, F. Sources of TFP growth in the Malaysian Islamic banking sector. *Serv. Ind. J.* **2009**, *29*, 1273–1291. [CrossRef]
69. Miller, S.R.; Parkhe, A. Is there a liability of foreignness in global banking? An empirical test of banks' X-efficiency. *Strateg. Manag. J.* **2002**, *23*, 55–75. [CrossRef]
70. Bello, D.C.; Radulovich, L.P.; Javalgi, R.R.G.; Scherer, R.F.; Taylor, J. Performance of professional service firms from emerging markets: Role of innovative services and firm capabilities. *J. World Bus.* **2016**, *51*, 413–424. [CrossRef]
71. Hatch, N.W.; Dyer, J.H. Human capital and learning as a source of sustainable competitive advantage. *Strateg. Manag. J.* **2004**, *25*, 1155–1178. [CrossRef]
72. Felekoglu, B.; Moultrie, J. Top management involvement in new product development: A review and synthesis. *J. Prod. Innov. Manag.* **2014**, *31*, 159–175. [CrossRef]
73. The Banker. The Banker Database. Available online: https://www.thebankerdatabase.com/ (accessed on 27 June 2020).
74. Armstrong, J.S.; Overton, T. Estimating Nonresponse Bias in Mail Surveys. *J. Mark. Res.* **1977**, *14*, 396–402. [CrossRef]
75. Rammstedt, B.; Beierlein, C. Can't we make it any shorter? *J. Individ. Differ.* **2014**, *35*, 212–220. [CrossRef]
76. Freel, M.S. Patterns of innovation and skills in small firms. *Technovation* **2005**, *25*, 123–134. [CrossRef]
77. Wang, D.; Su, Z.; Guo, H. Top management team conflict and exploratory innovation: The mediating impact of market orientation. *Ind. Mark. Manag.* **2019**, *82*, 87–95. [CrossRef]
78. World Economic Forum (WEF). The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution. Available online: http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf (accessed on 3 July 2020).
79. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.-Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef] [PubMed]
80. Toner, P. Workforce Skills and Innovation: An overview of major themes in the literature'OECD Science. In *OECD Technology and Industry Working Papers 2011/01*; OECD Publishing: Paris, France, 2011.
81. Buckley, P.J.; Park, B.I. Realised absorptive capacity, technology acquisition and performance in international collaborative formations: An empirical examination in the Korean context. *Asia Pac. Bus. Rev.* **2014**, *20*, 109–135. [CrossRef]
82. Marinov, M.A.; Marinova, S.T. *Emerging Economies and Firms in the Global Crisis*; Palgrave-Macmillan: Basingstoke, UK, 2013.
83. Bellalah, M.; Ghayad, R. *On Islamic Banking, Performance and Financial Innovation*; Cambridge Scholars Publishing: Newastle upon Tyne, UK, 2014.
84. Frame, W.S.; Wall, L.D.; White, L.J. Technological change and financial innovation in banking: Some implications for fintech. *FRB Atlanta Work. Pap.* **2018**. [CrossRef]
85. Mollah, S.; Zaman, M. Shari'ah supervision, corporate governance and performance: Conventional vs. Islamic banks. *J. Bank. Financ.* **2015**, *58*, 418–435. [CrossRef]
86. Janssen, O.; Van de Vliert, E.; West, M. The bright and dark side of individual and group innovation. *J. Organ. Behav.* **2004**, *25*, 129–145. [CrossRef]
87. Obstfeld, D. Social networks, the tertius iungens orientation, and involvement in innovation. *Adm. Sci. Q.* **2005**, *50*, 100–130. [CrossRef]
88. Burt, R.S. Network Disadvantaged Entrepreneurs: Density, Hierarchy, and Success in China and the West. *Entrep. Theory Pract.* **2019**, *43*, 19–50. [CrossRef]
89. Stasz, C. Assessing skills for work: Two perspectives. *Oxf. Econ. Pap.* **2001**, *53*, 385–405. [CrossRef]

90. Autor, D.H.; Levy, F.; Murnane, R.J. Upstairs, downstairs: Computers and skills on two floors of a large bank. *ILR Rev.* **2002**, *55*, 432–447. [CrossRef]
91. Stock, R.M.; Reiferscheid, I. Who should be in power to encourage product program innovativeness, R&D or marketing? *J. Acad. Mark. Sci.* **2014**, *42*, 264–276.
92. Pavitt, K.; Steinmueller, W.E. Technology in corporate strategy: Change, continuity and the information revolution. In *Handbook of Strategy and Management*; Pettigrew, A., Thomas, H., Whittington, R., Eds.; Sage: London, UK, 2002; pp. 344–368.
93. Allen, M.R.; Adomdza, G.K.; Meyer, M.H. Managing for innovation: Managerial control and employee level outcomes. *J. Bus. Res.* **2015**, *68*, 371–379. [CrossRef]
94. Kraisha, T.; Arthur, K. Can we have a general theory of financial innovation processes? A conceptual review. *Financ. Innov.* **2018**, *4*, 4. [CrossRef]