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## **Editorial Note**

The November 2019 issue of the *Journal of International Business Disciplines (JIBD)* has been the result of a rigorous process in two stages:

- Stage 1: all papers that were submitted to 2019 IABD conference went through blind reviews, and high quality papers were accepted for presentation at the conference.
- Stage 2: approximately ten percent of the accepted articles and two invited manuscripts were selected for possible publication in *JIBD*. The respective authors were contacted and asked to resubmit their papers for a second round of reviews. These manuscripts went through a blind review process. In the end, three articles were recommended for publication in the November 2019 issue of *JIBD*.

*JIBD* is committed to maintaining high standards of quality in all of its publications.

Ahmad Tootoonchi, Chief Editor  
*Journal of International Business Disciplines*

**A SURVEY OF ENTRY AND PARTICIPATION OF NORTHWESTERN U.S. SMALL AND MIDSIZED ENTERPRISES IN INTERNATIONAL MARKETS**

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# **A SURVEY OF ENTRY AND PARTICIPATION OF NORTHWESTERN U.S. SMALL AND MIDSIZED ENTERPRISES IN INTERNATIONAL MARKETS**

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## **ABSTRACT**

The backbone of the national economy is the small to midsize enterprise (SME) with 500 or fewer employees. These firms are entrepreneurial and innovative and are an engine for job growth in the United States. Of the net new jobs created in the U.S. from 2000 to 2017, almost 66% were created by SMEs (U.S.SBA Office of Advocacy FAQ 2018). Participation of small to midsize enterprises in the global economy has become important to the health of these companies. This paper reports on a regional survey of such firms in Montana, Idaho, Oregon and Washington regarding their international activities and involvement. The survey results generally indicate that small and midsize enterprises are increasingly aware of international business opportunities and many take advantage of them proactively or on an ad hoc basis. However, despite technological advances and the ubiquitous presence of the Internet and electronic commerce, many SMEs continue to be hampered by limited resources and structural impediments that have affected their ability to engage in international business over the years. Indeed, many such challenges continue to persist and new private and public initiatives may be needed to bolster SME participation in international business beyond the current levels.

## **INTRODUCTION**

International business has long been considered the domain of large multinational corporations. Small and mid-sized companies (herein after referred to collectively or individually as SME), however, have a potentially important role to play in the global economy. It is well known that SMEs are a major source of growth in individual national economies as these firms quickly adapt to changing conditions, take on more risks, generate more innovations and create more jobs than their larger counterparts. Thus, encouraging additional growth via international participation provides a means of promoting greater economic growth.

Generally, SMEs are credited with possessing the more flexible, quick response and risk taking entrepreneurial spirit components of the marketplace. The role of small and medium enterprises in international business has been growing and becoming more important (Torres-Ortega, Rialp-Criado, Rialp-Griado, & Stojan, 2015). However, earlier studies such as Barrett (1992) note that at the time few SMEs had any export sales. Although international activities of both small and

large firms has grown over time, the domestic success of the SME is not necessarily translating into participation in the global marketplace. Managerial attitudes about international markets, international marketing ability and a global orientation all impact the degree and the success of internationalization at small firms. A rather extensive literature review and summary of the successes and impediments of internationalization and the linkage to entrepreneurialism and firm strategy is available in Shooshtari, Manuel and Reece (2017). The aforementioned piece discusses important findings on SME internationalization efforts and challenges by Knight and Kim (2008), Game and Apfelthaler (2016), Wood, Logar and Riley (2015), Delehanty (2015), Brouthers, Nakos, Hadjimarcou and Brouthers (2009), Rundh (2015), Hollender, Zapkau and Schwens (2017), Drzeniek-Hanouz and Doherty (2013), Olejnik and Swoboda (2012), Carlsson and Dale (2011) and Love and Roper (2015) among others.

From 2006 to 2013 export by SMEs in terms of both number of firms exporting and the value of exports grew faster than for large firms. Delehanty (2015) and Wood, Logar and Riley (2015) indicate that SMEs that export tend to have faster growth, higher employment growth and pay than similar SMEs that do not export. Shooshtari, Manuel and Reece (2017) and others indicate that many additional export and import opportunities for SMEs remain untapped.

Exporting is a primary entry method in international markets for many SMEs. Drzeniek-Hanouz and Doherty (2013) suggest that reductions in transportation and information costs are particularly important for SMEs to succeed in internationalization as many are too small to gain cost efficiencies available to large firms who export in higher volumes. SMEs also typically have only a few staff who can be dedicated to exporting. U.S. SMEs' exports are primarily to Canada, Mexico, Great Britain, China and Germany, while imports are mostly from China, Taiwan, Italy, Germany and India (Baresse, Shelak, Pineda and Ewing 2016).

In the discussion of a 2015 survey of small businesses conducted by Wells Fargo International indicated that about half of small and about 60 percent of large companies believed it was important to expand internationally. U.S. businesses in general indicated that desirable characteristics of a foreign market included political stability, a base level of infrastructure development, favorable tariff and trade laws, the ability to enforce contracts in a timely fashion, low labor costs and access to credit.

This paper reports on a regional survey of small to mid-sized enterprises in Montana, Idaho, Oregon and Washington regarding their international activities and involvement. An earlier survey of the literature and a pilot study of SMEs in the Northwest by Shooshtari, Manuel and Reece (2017) found that many SMEs were still struggling with resource constraints, transportation costs, perceived riskiness of international markets and difficulty obtaining assistance and information on foreign markets. This study updates the results for Northwest SMEs. We find that many of the same resource issues remain a limiting factor in exporting and other international activities for SMEs. The results also indicate that firms are increasingly using the Internet and social and business networks to find trade opportunities. This is important because many SMEs have stated the lack of market information and trade leads are major limiting factors in their exporting activities. The results also indicate that many SMEs believe that traditional government assistance programs such as trade missions are not effective and suggestions for other programs that may augment existing activities are suggested.

## **BACKGROUND ON SME INVOLVEMENT IN INTERNATIONAL BUSINESS**

There is extensive literature on SME involvement in international business. Many of the findings are summarized in Shooshtari, Manuel and Reece (2017). Briefly, exporting can be a means to generate better growth and improve productivity, although Rundh (2015) and Brush (1996) have shown that industry specific factors also impact performance. Managerial skills in both production and marketing play a key role in international success. Firms that engage in more capital investment and R&D are more likely to have export success, although it is hard to determine the direction of causality as firms that invest more and are more involved in international markets tend to be more successful (Love and Roper 2015).

Another promising development over the last several years has been the increased successful entry of entrepreneurial firms who have leveraged networks to successfully engage in international markets. Acosta, Crespo and Collado (2018) studied 161 Mexican SMEs and found that their performance in international markets was positively related to their network capability and international entrepreneurial orientation. Additionally, Kim, Park and Paik (2018) found that top management leadership and external networking positively influenced the SME's innovative capabilities and international business success. This is a promising development since SMEs are considered to be more entrepreneurial and innovative compared to larger firms and should bode well for greater SME success in international business.

SMEs face financial and logistical barriers that large firms do not such as higher bank financing costs and lower availability of financing to fund export activities. Marketing barriers, including problems in adapting the product or service to a foreign market, inability to price the product competitively, shipping problems, dealing with foreign distribution channels and a lack of control over foreign sales also hamper SMEs' ability to succeed internationally (Hilmersson and Johanson 2016, Love and Roper 2015).

Lack of information about markets and distributors is probably the most often cited constraint to SME internationalization. One purpose of trade fairs may be to develop social networks and allow SME managers to build contacts with other firms who are involved in international markets. However, many SMEs indicate that these activities are not good investments and they don't participate. Government assistance programs to help exporters can be beneficial when there are resource constraints. For instance, Kalafsky and Duggan (2016) report on SME exporters from Nova Scotia who succeeded despite limited resources by utilizing government trade assistance programs, maintaining face-to-face contacts and working with international partners.

## **SURVEY METHODOLOGY**

For the current survey concerning internationalization activities, 2982 emails were sent via email to small and mid-sized Enterprises (SMEs) in Montana, Idaho, Oregon and Washington. We located the contact information for these companies using LexisNexis Uni, which purports to offer



“Unparalleled business information on more than 80 million U.S. and international companies and more than 75 million executives.” (LexisNexis 2017). Access to this service is available at over 18,000 libraries, including the one at our university.

After an initial email in January, three follow up emails were sent in the spring of 2018. One hundred four usable responses were returned yielding a 3.5% response rate. Although we would have preferred a larger response rate, given that we did not have a prior connection to these companies or sponsorship by an association or organization that represented them, a low response rate was not surprising. Unfortunately, we did not have the financial resources to offer a monetary incentive that some survey's offer in order to encourage greater response rate.

## **RESULTS**

In our study, we were particularly interested in findings regarding the tangible and intangible resources needed by smaller firms to augment or adversely affect the firms' ability to export, import or trade in foreign ventures. Respondent demographics are provided in Table 1. Panel A of Table 1 shows that almost 20% of the respondents had 9 or fewer employees, and 38% had between 10 and 49 employees. Seventeen percent employed 50 to 100 personnel, 22% had between 100 and 500 employees while a few had over 500. Many respondents, (42%) had \$5 million dollars or less in annual sales while 52% had sales levels between \$5 million and \$250 million. The largest percentage of respondents were located in Montana (40% of respondents), followed by Washington, 22% and approximately equal percentages of the remaining respondents were from Idaho and Oregon.

**TABLE 1: RESPONDENT DEMOGRAPHICS**

Panel A: Employees, Sales & State			
Employees	Percent	Sales	Percent
1-9	19	0 to 0.5 million	13
10-49	38	0.5 to 1 million	2
50-99	17	1 to 5 million	27
100-500	22	5 to 10 million	21
500+	6	10 to 25 million	18
		25 to 100 million	10
		100 million to 250 million	3
		> 250 million	5
State	Percent		
Idaho	14		
Montana	40		
Oregon	13		
Washington	22		
No Response	11		
Panel B: Industry			
Agricultural Products	4	Panel C: Participation in International Activities	
Manufacturing	25	Yes	46
Services	35	No	54
Retail trade	6		
Wholesale trade	5		
Transportation & distribution	2		
Communications & utilities	4		
Construction & contracting	3		
Finance/Insurance/Real Estate	5		
Other (please specify)	12		

Panel B of Table 1 provides the breakdown of industries representing the respondents' primary line of business. Twenty-five percent were in manufacturing, 35% in services and an additional 11% were in either wholesale or retail trade. Forty-six percent of respondents indicated that their firms were currently involved in international business, which includes exporting, importing, joint ventures or investing either locally or overseas with a foreign company (Panel C). Conversely, 54% were not currently engaging in such activities.

Participation in trade missions, or similar organized activities, designed to generate trade leads can provide a valuable resource to SMEs who wish to engage in international activities. Table 2 contains data on participation in trade missions or in organized meetings with potential trade partners and reveals that only 25% had participated in these activities. This is the same percent found in the earlier survey by Shooshtari, Manuel and Reece (2017). The trade missions were reported to be primarily to Canada, China, Mexico, Germany and Japan. These countries are major

markets for Northwestern U.S. exports. Many SMEs, however, do not choose to participate in these activities. The survey asked respondents to indicate what prevented them from going on a trade mission or attending a trade show. About 26% of respondents indicated they did not participate because the cost was too high. Another 23% stated that these programs provided a bad return on investment. Time away from the office was mentioned by 9% of the respondents, and 28% said that these trade missions did not apply to their line of business. Thirteen percent stated other reasons for their lack of participation.

The survey also contained an open-ended question about why they did not participate. Responses varied from not interested in selling overseas to traveling abroad on their own to build business contacts and a reduced need for these activities with the ability to videoconference and electronically communicate directly with foreign entities. One respondent noted that trade missions tended to serve the interests of the organizers, and were not needed with the growth of ecommerce. These results imply that a restructuring of state and federal trade promotion efforts may be warranted to assist and encourage more SMEs to participate in global activities. Overall returns to trade promotion may be higher when focused on larger firms and it is possible that is why SMEs feel trade promotion activities are not particularly worthwhile for them. A paper by the International Trade Centre (2016) entitled “Investing in Trade Promotion Generates Revenue - A study of Trade Promotion Organizations” found that trade promotion efforts yield higher returns when they focus on larger firms and had more private sector governance. This still leaves a niche for promotion efforts aimed at SMEs. They will have to be cost effective, tailored to the SMEs business and probably tout the benefits of internationalization. They should be provided locally or online at a subsidized cost and should be designed generate specific trade leads, assistance in shipping and in locating foreign distributors for a targeted set of SMEs.

**TABLE 2: HAS YOUR FIRM PARTICIPATED IN TRADE MISSIONS, MEETINGS WITH POTENTIAL TRADING PARTNERS, FROM ANOTHER COUNTRY (E.G. CANADA, MEXICO, CHINA, ETC.)?**

Panel A	Percent				
Yes	25				
No	75				
Panel B: If so, which countries?					
	# times mentioned		# times mentioned		# times mentioned
Canada	13	Norway	2	Australia	1
China	7	Korea	1	Poland	1
Mexico	7	UAE	1	Saudi Arabia	1
Germany	6	Netherlands	1	Singapore	1
Japan	5	Switzerland	1	Greece	1
UK	3	Sweden	1	Belgium	1
Italy	3	Peru	1	Finland	1
France	3	India	1	Brazil	1
Everywhere	2	Spain	1	Chile	1
Russia	2				
Panel C: What discourages you or keeps your firm from going on a trade mission or attending a trade show?					
	Percent				
Not applicable	28				
Cost	26				
Time away from office	9				
Bad ROI*	23				
Other	13				

\*due to various problems with trade missions/shows and other impediments to exporting

Table 3 contains data on SME usage of assistance programs. The data show that only 21% of respondents had utilized any federal or state trade assistance programs while 79% had not. The most commonly used program was either federal or state department of commerce grants. Of those who responded to the question as to why they did not use any programs, 26% of respondents said they were not aware of any programs available to them, and 25% indicated that the programs were either not available for their line of business or not useful to them. Over one-fifth indicated they were simply not interested in using any assistance programs.

**TABLE 3: HAVE YOU USED ANY FEDERAL OR STATE INTERNATIONAL TRADE ASSISTANCE PROGRAMS?**

	Percent of respondents
Yes	21
No	79
Number of No Responses	34
If yes, what services did you use	# Times mentioned
State Department of Commerce grants to fund international sales	3
US Department of Commerce grants	2
Western United States Agricultural Trade Association assistance	1
SBA loans	1
State grants to defer costs of trade mission and trade show costs	1
Other	1
	# Times Mentioned & Percent of this category
If no, please briefly indicate why not	
Not aware of any programs	6 (26%)
Not applicable to our business	5 (22%)
Not interested or not needed	5 (22%)
Not useful	3 (13%)
Other	4 (17%)

The survey asked what forms of trade-related assistance they would like to receive. Market research and help in finding foreign distributors were often cited as desirable. The survey results are presented in Table 4. Forty-eight percent of respondents indicated either a high or a moderate interest in receiving assistance in the form of international market research. Sixty-six percent had high or moderate interest in assistance in promoting their product or service and 58% wanted to know about trade related events in their area. About half of respondents wanted information about websites that provided trade information and events as well. Slightly fewer than 50% of respondents had high or moderate interest in obtaining contacts with those individuals or firms that might have trade leads or who are agents/distributors doing business overseas. There was much less interest in receiving other types of services such as cultural or foreign language training, translation services, legal training, strategic planning and payment risk evaluation. Earlier literature had cited these as concerns, but they appear to be less important today. Other assistance suggested included trade funding sources, staffing help, export subsidies to offset high U.S. labor costs and information on low cost shipping options. Time and transportation costs are still a concern for some.

**TABLE 4: PLEASE INDICATE YOUR INTEREST IN RECEIVING ASSISTANCE IN EACH OF THE FOLLOWING TYPES OF TRADE RELATED SERVICES IF THEY WERE SPECIFICALLY RELATED TO YOUR PRODUCT OR LINE OF BUSINESS WITH “H” INDICATING HIGH INTEREST, “M” INDICATING MODERATE INTEREST AND “L” INDICATING LOW OR NO INTEREST**

Types of Assistance	% Responses		
	H	M	L
International market research	25	23	52
Promotion of your products or services	36	30	34
Trade related events in your area	19	39	42
Website providing trade information and events	13	38	50
Contact with individuals or firms having trade leads or who are agents/distributors doing business overseas	17	30	53
Cultural/foreign language training	9	20	71
Translation services	8	19	73
International law/legal system training	6	27	67
International trade strategic planning	11	25	64
Payment risk evaluation and trade financing	9	28	63

With the growth of the Internet and the availability and use of social media, SMEs have new methods to generate trade leads and business deals that were not as readily available 10-20 years ago. Table 5 contains data on SME usage of online sources and social networks to promote trade. According to data in Table 5 almost half (46%) of respondents use social media or other online business networks to find international market opportunities. Seventeen respondents indicated they used Facebook, 12 indicated using industry websites, 11 used Linked-In and 6 and 5 used Instagram and Twitter, respectively. Only 2 cited using Amazon. This suggests that trade promotion aimed at SMEs might be successfully conducted using the Internet and social media. Linked-In or Facebook might be used by state trade promotion agencies as a low-cost method to more systematically facilitate contacts between local producers and foreign buyers or distributors for SMEs.

**TABLE 5: DO YOU OR YOUR FIRM USE SOCIAL MEDIA OR OTHER ONLINE BUSINESS NETWORKS TO FIND INTERNATIONAL MARKET OPPORTUNITIES?**

	% Response
Yes	46%
No	54%
No response	34
If yes, please indicate methods such as Facebook, Linked-In, industry website, etc.	
Facebook	17
Industry websites	12
Linked-In	11
Instagram	6
Twitter	5
Amazon	2
Google	2
Shopify	1
Financial Times	1
Construct Connect	1
YouTube	1
Pinterest	1
eBay	1
Vimeo	1
Other	5

Many potential barriers to internationalization exist for SMEs. Some are financial, some are other types of resource constraints, some are knowledge related and some are psychological. The survey asked respondents to consider barriers that seriously, moderately or not at all, limit their ability to engage in international activity. The survey results are presented in Table 6. Forty-six percent of respondents believe that international activities are a poor return on investment, so just under half of respondents believe it is not worthwhile to pursue international activities. Given the large and growing market potential outside the U.S. coupled with the decline in trade barriers, transportation and information costs, this perception is unlikely to be true for most firms. While 55% of respondents indicated that transportation costs and risks were not a limiting factor, approximately 45% listed these as either serious or moderate concerns. Almost half of respondents still indicate a lack of international knowledge and experience are either serious or moderate concerns that limit the firm's ability to engage in international activities. Prior literature indicates that many SMEs have difficulty locating foreign distributors or sales reps. Thirty-eight percent of respondents indicated this was a serious or moderate limitation, but 62% indicated it was not a limiting factor at all. It is possible that the growth of globalization, the Internet and reduced communication costs are reducing the impact of this often-cited limitation. About half of respondents listed concerns about legal issues as a serious or moderately limiting factor. Similarly, 55% of respondents listed foreign government regulations as a serious or moderately limiting factor. Fewer respondents in general were concerned that foreign markets were too risky to enter, or that supply chain concerns,

cultural differences, pricing concerns and exchange rate fluctuations were limiting factors to internationalization.

**TABLE 6: PLEASE INDICATE THE EXTENT THAT EACH OF THE FOLLOWING CONCERNS ADVERSELY AFFECTS YOUR ABILITY TO EXPORT, IMPORT OR ENGAGE IN FOREIGN VENTURES. PLEASE MARK EACH ITEM WITH AN S IF IT IS A SERIOUS CONCERN, M IF IT IS A MODERATE CONCERN AND N IF IT IS NOT A CONCERN.**

	S	M	N
	%	%	%
Cannot obtain financing needed	8	19	73
Believe it is a poor return on investment	23	23	55
Transportation costs and risks	22	23	55
Lack of international knowledge & experience	20	28	52
Concerns about receiving payment for product	17	30	53
Unable to find foreign distributor or sales representative	20	18	62
Concerns about legal issues	18	30	52
Believe that foreign markets are too risky	13	23	63
Do not know appropriate price point	13	18	68
Concerns about supply chain	12	18	70
Lack of market research	18	28	53
Nature of my product (perishable, culturally unique, etc.)	17	14	69
US government regulations	18	23	58
Foreign government regulations	22	33	45
Cultural differences	10	27	63
Exchange rate fluctuations	15	25	60
Too small to do business internationally	21	18	61

Lack of knowledge is still cited as a barrier to successful internationalization. Emulating the efforts of large firms is not likely to work for many SMEs that are resource constrained. Training designed to promulgate best practices based on prior successes would seem to be a valuable resource for many SMEs. Zarei, et al. (2011) has developed a business plan designed to capture and facilitate the dissemination of best practices for SMEs to globalize their efforts. Table 7 contains the results of a question which asked respondents to indicate their willingness to attend a training session that was targeted to their industry and showcased best practices in international trade for similar size firms. About 61% of respondents who answered this question were not interested in attending this type of seminar or conference. Most respondents who indicated why they were not interested felt the best practices idea was not applicable to their enterprise and some were concerned the activity would not yield a good return on investment. The survey asked what they would consider to be a



reasonable cost to attend such a seminar or conference. Twenty-three percent of respondents indicated the cost should be less than \$200, another 19% stated it should cost between \$200 and \$500 and 23% said it should cost between \$500 and \$1000. Another nineteen percent indicated they either had no idea or that the price would depend on what was offered. It appears that a cost of \$500 is an appropriate price points for such seminars, though some firms indicated they would not attend at any cost. SMEs do not seem willing to invest a lot of resources on training or participating in trade promotion, perhaps because they don't see the value of these efforts. If undertaken, the cost will probably have to be subsidized, at least initially until participants are convinced such seminars are worthwhile.

**TABLE 7: WOULD YOU BE INTERESTED IN ATTENDING A SEMINAR OR CONFERENCE DESIGNED TO SHOWCASE BEST PRACTICES IN INTERNAIONAL TRADE OF SIMILAR SIZE SUCCESSFUL FIRMS IF IT WERE TARGETED TO YOUR INDUSTRY?**

Panel A:	% Response	
Yes	39	
No	61	
# of Responses	69	
If No, please indicate why not:		
Reason	# Times Mentioned	
Poor return on investment	3	
Lack of resources	2	
Already know what to do/have a network	2	
Not applicable to us	10	
Not interested	3	
Panel B: What would you consider a reasonable cost to attend the type of seminar or conference mentioned in the prior question if it were targeted to your industry?		
	#	Percent
≤ \$200	6	23
> \$200 to < \$500	5	19
\$500 to < \$1000	6	23
> \$1000	4	15
No idea or it depends	5	19
Total	26	100

The second part of the survey was aimed at SMEs that were currently engaged in international business of some kind. As shown in Panel A of Table 8, 47 respondents indicated they were currently involved in international business. Of those respondents, twenty-six were involved in

exporting, 12 in importing, 5 had formed a strategic alliance with a foreign partner and 4 provided no response.

**TABLE 8: WHICH OF THE FOLLOWING ACTIVITIES DOES YOUR FIRM ENGAGE IN ? (PLEASE CHECK ALL THAT APPLY)**

Panel A: Activity	Number	Percent of Respondents
Exporting	26	60
Importing	12	28
Strategic Alliance with a foreign partner	5	12
No Response	4	

Panel B: Approximately what percentage of your total dollar volume of annual sales is foreign?

Foreign sales percent of total sales	Percent of respondents
< 10%	23%
10%-30%	41%
> 30%	23%
Unusable responses	14%
Total number of responses	22

Panel C: What are the top three foreign countries by total dollar volume of annual sales where you do business or make investments?

Country	# of times mentioned
Canada	12
China	7
Japan	6
Mexico	6
UK	6
France	4
Australia	3
Germany	2
Korea	2
Sweden	2
Brazil	2
Chile	1
Denmark	1
Ireland	1
Netherlands	1
Russian Fed	1
Saudi Arabia	1
Spain	1
Viet Nam	1

The survey asked this subgroup of firms that were engaged in international business, what percentage of the dollar value of their sales was foreign (Panel B). The most common response indicated that between 10 and 30% of sales were foreign. The data in Panel C show that foreign sales and/or investments involved 19 different countries, but the most often cited were Canada, China, Japan, Mexico, the UK, France, Australia and Germany.

We asked respondents in this group to identify what challenges they faced in their international activities. Of the 60 responses, 28% were related to exporting, including obtaining information about exporting, finding trade leads and locating foreign distributors for their product or service. Only 5% of respondents indicated export financing, product or packaging issues or translation services were a challenge. Eight percent of respondents indicated that managing shipping was a challenge. Trade documentation and dealing with trade regulations were cited as challenges by more than 10% of respondents. Less commonly cited issues were problems with customs, currency issues, different product requirements outside North America and transportation costs.

**TABLE 9: WHICH OF THE FOLLOWING PRESENT CHALLENGES FOR YOUR FIRM IN DOING BUSINESS ABROAD? (PLEASE CHECK ALL THAT APPLY.)**

	Percent	Change from old
Obtaining information about exporting	8	Down
Finding trade leads	17	Down
Searching for distributor/agent abroad	13	Down
Locating export financing	5	Down
Managing shipping operations	8	Down
Redesigning product or packaging	5	Down
Translation services	5	Down
Trade documentation	12	n/a
requirements		
Dealing with trade regulations	15	
Other (please specify)	12	
Total Number of Responses	60	

The SMEs were asked how they obtained information about international markets or new trade leads. A total of 78 responses to this question were received (see Panel A of Table 10). By far the largest source of information was in-house research with 31% of respondents indicating this choice. About 17% indicated they used industry associations and 13% use trade agents or brokers. Only 8% used government assistance to locate potential leads or new market opportunities. About 9% of respondents indicated they used informal business networks such as personal contacts, and over 6% used social media such as Facebook. Only a few respondents used Linked-In to make business contacts. Other choices included Chambers of Commerce, paid consultants, and educational associations, but very few respondents indicated using any of these. A few respondents indicated they relied on customers finding them online or via email.

**TABLE 10: WHAT INFORMATION SOURCES DO YOU RELY ON FOR INTERNAIONAL TRADE MARKET RESEARCH, INFORMATION ON TRADE LEADS OR POTENRIAL NEW MARKETS? (PLEASE CHECK ALL THAT APPLY)**

Panel A: Information Sources	Percent
In-house research	31
Paid consultants	1
Government assistance organizations	8
Industry associations	17
Educational associations	1
Chamber of Commerce	3
Social media	6
Informal business network	9
Formal business network such as Linked-In	3
Trade agents/brokers	13
None	3
Other, please specify	6
Total Number of Responses	78

Panel B: Would you say your internationalization efforts occur primarily:	Percent of Respondents
as an opportunity arises	61
as part of your strategy	39
Total Number of Responses	17

Prior literature indicates that many SMEs pursue international opportunities opportunistically as leads emerge or as problems in the domestic market develop. More entrepreneurial firms proactively and strategically seek out opportunities to grow internationally. The latter are more likely to persist in international activities and to grow more quickly than the prior group. The survey asked respondents to indicate whether they had a deliberate internationalization strategy or whether their efforts occurred as an opportunity arose. As indicated in Panel B of Table 10, only 17 respondents answered this question, but 61% of those who did indicated their international activities arose in opportunistic fashion, whereas 39% indicated their activities were an intentional part of their strategy. It is encouraging that 39% did include international activities as part of their strategy, but a large percentage of SMEs do not appear to consider global market activity in a strategic fashion.<sup>1</sup> While for some firms it may not make sense to incorporate globalization as part of their strategy, this likely represents missed opportunities for growth for many SMEs.

<sup>1</sup> Only 17 firms (22%) responded to this question. We think it is likely that those who did not respond probably do not seek out international opportunities as a part of their strategic plan.

We asked respondents who currently engaged in global activities how they believed their level of international involvement would change over the next 3 to 5 years. Responses are found in Table 11. Twenty-six respondents answered this question, with 88% indicating they expected to see their involvement increase. Approximately 12% said it would stay the same, and none indicated it would decrease. Respondents who are already engaged clearly believe that they will continue to be involved in international markets and most expect their international activities to increase. Twenty respondents elaborated on why they thought their international presence would change. Of those, sixty percent indicated they believed that foreign markets would grow in the future. Ten percent indicated that more foreign partners, such as distributors, would grow and become available. One respondent had recently merged with another company which had a global presence. Three respondents (15%) indicated that they were increasing their focus on international markets as a part of their strategy.

**TABLE 11: BASED ON YOUR EXPERIENCE, DO YOU EXPECT THE LEVEL OF INVOLVEMENT OF YOUR COMPANY IN FOREGIN TRADE OVER THE NEXT 3 TO 5 YEARS TO:**

	Percent of responses
Increase	88
stay the same	12
Decrease	0
Number of responses	26
In a sentence or two please elaborate on the reasons for your particular response to the previous question.	
	Percent of responses
Growth in foreign markets	60
Growth in foreign partners/ merging with them	15
Increased focus on internationalization	15
Other	10

The third and final part of the survey was aimed at respondents who were not currently engaged in international activity. The survey asked this subgroup if they had previously been involved in global activities. Panel A of Table 12 shows that 24 percent of this group had been involved at some point in the past. As to why they were no longer involved, the most frequent response was that it was too risky (27%) as shown in Panel B. About 18% of respondents noted an inability to find a strategic partner or a trustworthy distributor led to ending their involvement. Other responses indicated they were too busy with the domestic market, it was a poor return on investment, or currency fluctuations were too high. As a follow-up the survey asked respondents to identify what it would take to for them to become involved in exporting or invest in international trade. A summary of results is found in Panel C. There were only 16 responses to this question.

Some firms believed they needed more knowledge of foreign markets and regulations. Several indicated international activities did not fit their business model. Other requirements mentioned included help with regulations and legal advice, greater knowledge of customs rules and cheaper shipping. Two firms indicated the need to be able to communicate and work through the Internet while remaining in the U.S. The largest group of responses indicated they were not interested or international activity was not applicable to their business. Prior literature has indicated that lack of knowledge about foreign markets and the inability to find trade partners limits internationalization for small firms. The survey results are consistent with this finding.

**TABLE 12: IN THE PAST, HAVE YOU EVER BEEN INVOLVED IN A FOREIGN VENTURE OR EXPORTED YOUR PRODUCT OR SERVICE ABROAD?**

Panel A:	Percent of Respondents
Yes	24
No	76
Number of respondents	49
Panel B: If you answered yes, please indicate why you stopped (Please check all that apply.)	
	Percent of Respondents
Too risky	27
Inability to find a strategic partner or trustworthy distributor	18
Too busy with domestic market	14
Poor return on investment	14
Exchange rate fluctuations too large	14
Shipping costs and losses too high	0
Other, please specify	14
Panel C: If you answered no please indicate what you would require to export or invest in international trade	Percent of Respondents
Knowledge of foreign markets & regulations	19
Need to grow first	13
Change in business model	13
Better communications without traveling	13
Not applicable or not interested	38
Other	6
Number of responses	16

We wanted to know if SMES who were not engaged internationally were interested in a mentor providing assistance and advice to help find global opportunities. The survey asked the group who are not currently engaged in international activities if they would be interested in having a business person who has successfully engaged in international trade in a similar industry serve as a mentor

to their firm if they were not a direct competitor. The results are presented in Table 13. Eighteen firms or 37% of this subgroup indicated they would be interested in a mentor. The survey asked this subgroup how they would want the mentoring relationship to be established. The most common response was by email (47%), although a one-on-one meeting was chosen by 33% of respondents. About 13% indicated Linked-In, but only 7% said by attending a conference.

**TABLE 13: WOULD YOU BE INTERESTED IN HAVING A BUSINESS PERSON WHO HAS SUCCESSFULLY ENGAGED IN INTERNATIONAL TRADE IN A SIMILAR INDUSTRY SERVE AS A MENTOR TO YOUR FIRM IF THEY WERE NOT A DIRECT COMPETITOR OF YOUR FIRM?**

Panel A:	Percent of Responses	
Yes	38	
No	62	
Number of respondents	48	
Panel B: If you answered yes how would you like the mentoring relationship to be established? Please indicate the most preferable and the least preferable method		
	Most Preferable (Percent)	Least Preferable (Percent)
by email	47	7
by social media such as Facebook	0	27
by Linked-In	13	7
by attending a conference that promotes contacts	7	0
by phone	0	33
meeting one-on-one	33	27

## CONCLUSION

The current survey results indicate that lack of interest and knowledge about international opportunities remain the primary barriers to increased participation by Northwest U.S. SMEs in international activities. Many consider the effort to be a poor return on investment (ROI). Poor ROI is also often cited as a reason for not participating in trade missions, or in seeking out trade related government assistance. If state and federal programs wish to generate greater participation by SMES, they may have to change their focus and their approach. The growth of the Internet and social media indicates that assistance programs may wish to focus on delivering market and legal knowledge, assisting in trade leads, etc. via these media rather than by holding trade promotion events aimed at SMEs.

A majority of the SMEs surveyed that are engaged in international activities see their involvement increasing over time, so many see the opportunity and the need to grow internationally. Programs that encourage mentoring of SMEs interested in international business by those already engaged successfully in international activities may provide benefits that generic programs offered by federal, state or local do not offer. States in particular may wish to make available local mentors to SMEs to help overcome perceived barriers due to lack of knowledge, exaggerated belief in the risk of doing business internationally, or perceived poor ROI from such activities. SMEs should be encouraged to network with other firms, engage in entrepreneurial internationalization and make globalization a part of their strategy. The findings of Acosta, Crespo and Collado (2018) and Kim, Park and Paik (2018) indicate these characteristics lead to a higher degree of success and growth in SMEs. As indicated before, SME growth is a catalyst for economic growth, more jobs and income growth.

Many SMEs still cite many of the same barriers to internationalization that existed many years ago, including lack of market knowledge, difficulty in locating foreign distributors, too much risk and an insufficient ROI. Many such limitations, including resource constraints and lack of sufficient experience may be inherent to some SMEs. A different approach to educate and assist this latter group, therefore, may be warranted. Governments have a role to assist these SMEs. The Kalafsky and Duggan (2016) results that led to improved international involvement of Canadian SMEs are encouraging. Government assistance efforts should be focused at the local level, cost-effective for resource constrained SMEs, targeted to specific groups that can grow, and should include the opportunity to establish mentoring relationships. Augmenting existing trade fairs, etc., with these efforts could offer effective solutions to greater SME involvement in international markets. Increasing SME participation in global markets will continue to be challenging, but the survey and literature results indicate that new and innovative methods may be needed to increase the number of firms who attempt to grow internationally.

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# **THE STRATEGIC IMPERATIVE FOR CITIZEN INVOLVEMENT IN WEALTH CREATION: THE CONTEXT OF AFRICA AS A DEVELOPING CONTINENT**

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## **ABSTRACT**

Observers of the economic fortunes of countries in sub-Saharan Africa know that the majority of the people are mired in poverty. The situation is so endemic that many seem to have accepted it as normal. Researchers and multilateral organizations have suggested programs, and plans aimed at alleviating the problems. The bulk of these focus on diagnosing governmental action and public policy geared toward increasing productivity within the continent. While these prescriptions remain contextually useful, they have proven to be insufficient in addressing the problems. Anchored on Innovation Economics, this paper recommends a viable option that is centered on the citizen and involves the invocation of creativity and entrepreneurship. This option is anchored on the antecedents of African societies in the pre-colonial era, the place of the citizen within those societies, and the need to relocate the citizen as central to wealth creation and poverty eradication.

## **INTRODUCTION**

Pythia, the Oracle of Delphi, has historically been known as the most prestigious and authoritative oracle among the ancient Greeks, and she is considered with little doubt to have been the most powerful woman in the classical world (Scott, 2014). If all the Intellectuals, Economists, and Politicians had a chance to ask her on behalf of Africa for the secret to being wealthy, what would her response be? Would she say that they should work hard, get an education, and sell their natural resources in exchange for dollars? Probably not. Her most likely response would consist of a few words, do what you do best and trade for the rest! A concept that Adam Smith must have been aware of when he wrote “An Inquiry into the Nature and Causes of the Wealth of Nations”, more prominently known by its abbreviated name, The Wealth of Nations.

In presenting his arguments against mercantilism, the notion that nations only become wealthy through the maximization of the accumulation of gold and silver at the expense of the welfare of their citizens, and physiocracy, the idea that nations become wealthy solely from the value of land agriculture or development. The more practical aspects of his theses have been adopted in various forms to huge success among the wealthy nations of the world. Wealthy nations have found ways to do what they do best, and trade for the rest! It really is that simple.

In discussing the aggregate well-being of nations, this paper adopts wealth as the standard of measurement rather than Gross Domestic Product (GDP). First in financial theory, wealth is futuristic; it is the flow of income that an asset can generate over its lifetime. Additionally, in line

with economic theory, total wealth is defined as the present value of future consumption (World Bank, 2006). Whereas GDP gives an important measure of the progress made in an economy by capturing income and production, it ignores changes in the underlying asset base (or wealth) within the same economy (World Bank, 2018). The national income and the well-being of a country are bolstered by her assets or wealth which include produced capital, natural capital, human capital, and net foreign assets. The World Bank report on the “The Changing Wealth of Nations” (2018) asserts that using GDP by itself can make us easily fail to capture several factors: the depreciation and depletion of assets, the rate of change of investment and wealth accumulation with population growth, and how adequately a nation’s mix of assets satisfy her development goals. To ensure sustained long-term economic growth, a nation must make investments in and with, and judiciously manage, the broad portfolio of assets that constitutes her wealth. There is a strong link between the changes in wealth and the capacity of any country to sustain development.

Despite their best efforts, African nations have so far failed to grow, create and maximize the level of wealth necessary to improve the living conditions of their people. So far, all the development plans and programs largely driven by central governments, have fallen short. The receipts that have accrued from selling natural resources have proven inadequate to satisfying the needs of growing populations.

This study recommends that African economies adopt innovation economics; begin to actively and deliberately create and maximize wealth by focusing on what they do best, not what they can sell fast, and then trade for the rest. For this to happen, the continent must hearken back to her pre-colonial inventiveness and innovativeness and put the citizen instead of the development plan at the center of economic activities.

The paper proceeds with a discussion, in terms of the economy, of where the continent has been, thereafter, it highlights the extant situation, and then concludes by making suggestions on where the continent needs to be headed.

## **THE PAST AS PROLOGUE**

### **Post-Colonial Economies and the Era of National Development Plans**

A vast majority of the African countries achieved independence from their major colonizers (France, Great Britain, and Belgium) in the 1960s. It has been argued by some scholars that most of the members of the rising African leadership class that acquired control of governments lacked the requisite experience for governance and capital accumulation (Cullen and Parboteeah, 2014). To a large extent, these elites promised their citizens stability and economic development in exchange for a monopoly on political power and control. To compound this problem, external-focused growth capabilities were viewed suspiciously because they were seen as foreign interference by the erstwhile colonizers. As a result, most African governments in deference to internal pressures engaged in predominantly state-led and inward-focused industrialization efforts (Cullen and Parboteeah, 2014). These state-orchestrated and state-controlled efforts were designed

and codified into National Plans and made central to the growth vision and mission of the countries where they were adopted.

In a March 2013 blog post under the aegis of the United Nations Economic Commission for Africa (UNECA), Carlos Lopes highlighted the long and checkered history of development planning in Africa. His report states *inter alia* that:

The first phase of development planning in Africa spanned the 1960s and was characterized by centralized planning with three to five year planning phases. During this period, at least 32 African countries had a national development plan. This first generation of development plans continued to the 1980s. These plans promoted state-engineered economies with resources allocated by governments. It was notably the time of state-owned enterprises operating in most of the productive sectors.

However, Africa's development plans of the 1960s had limited success. This was due to a variety of reasons: deficiencies in the plan documents surely, but also failure to implement them; ambitious formulation of targets; institutional and bureaucratic weaknesses; exogenous shocks; and political factors

The second phase in the evolution of planning in Africa was marked by a wholesale abandonment of planning under neoliberal Structural Adjustment Programs (SAPs), which emerged in the 1980s-1990s with the support of the Bretton Woods Institutions. SAPs aimed to reduce the role of the State in production and service delivery and placed emphasis on macroeconomic stability, downsizing of public sector institutions, privatization and reducing government spending and budget deficits...

To cut a long story short, if the development plans formulated and implemented by African governments between the 1960s to the 1990s yielded growth and wealth accumulation, the evidence of such is yet to be seen. At the end of the 1980s the economic situation of most African countries was bleak.

Suddenly, we are in the 1990s: the Soviet Union has collapsed; East and West Germany are reunited; central and Eastern Europe are becoming more open and accessible; the Asian Tiger nations (South Korea and Singapore) have taken flight on the back of industrialization and sustained economic growth; the globe has begun its technological trajectory toward shrinkage; and the burgeoning youth of Africa become very restive and more urgent in their demand for liberal and multi-party democracy. African leaders begin to face massive pressures from concerned entities both at home and abroad. With their economic failures staring them in the face, and their inept administrative capacities thus laid bare, the leaders begin to accept either willingly or grudgingly to transform the political and economic structures in their domains.

By the turn of the century, the African Union had become fully invested in ensuring that every government in the continent has some form (if not exclusively so) of participatory democracy. But as if the pains of the preceding decades were not enough, many nations re-embarked on the national plans of the previous years by switching to another modified form known as Poverty Reduction Strategies (PRSs). As Lopes (2013) notes in the UNECA blog post:

In the early 2000s, SAPs were replaced by Poverty Reduction Strategies, which aimed at reversing the negative effects of a decade of Structural Adjustment on welfare and social conditions. PRSs placed strong emphasis on poverty reduction as a condition for debt relief. Many African countries embarked on at least two generations of PRSs, mostly to ensure eligibility for debt relief. Notwithstanding the principle of ownership and consultations that underpinned PRSs, they lacked credibility because of the externally driven nature of the process. Furthermore, PRSs tended to place disproportionate emphasis on the social sector at the expense of the productive sector thereby raising questions about the sustainability of the poverty reduction agenda.

### **The 21<sup>st</sup> Century and the Era of Comprehensive Development Plans**

As more and more countries in the continent embraced multi-party democracy, these newer governments become more willing not only to open their political and economic systems, but also to interconnect and integrate with other countries in their region and in the continent. Many countries in the continent moved to adopt more comprehensive development plans that provide for the scrutiny, by both internal and external parties, of their impact on the economy and polity. These comprehensive plans adopted in the early 2000s go beyond the near-sighted Poverty Reduction Strategies (PRSs). Perhaps it was just for want of something new or maybe it was born out of what may have been the best available insights but the plans had more long-term oriented development visions and their frameworks were made to contain plans for ambitious growth and social development goals. As Lopes (2013) states in his blog post, the:

Development Strategies have now gone beyond the narrow objective of poverty reduction to encompass objectives such as accelerated growth, employment creation, structural transformation and sustainable development. Unlike the 1960s, these plans employ a mix of state and market-based approaches and appreciate the critical role of both the public and the private sector in the development process. Many African countries have developed Long Term Visions to guide their steps towards these ambitious objectives. These long-term visions are characterized by stronger ownership from African actors and a more consultative and participatory process involving a broad spectrum of stakeholders, including Civil Society, the private sector, decentralized constituencies and development partners. These broader national development plans often take into consideration various global and continental development goals and frameworks such as New Partnerships for Africa's Development (NEPAD).

The conclusion of the UNECA blog post was that many challenges remained. There was still the need to ensure credible consultation processes, to prioritize funding in line with development aspirations, to coordinate donors (imagine the irony, after 40 years of planning, donations were still welcome), to strengthen capacities to implement projects and programs, and to develop effective monitoring and evaluation systems that feed back into the policy making process. To

summarize in UNECA's own words, "in short, more work is required to improve the planning frameworks in Africa in order to translate development aspirations and priorities into concrete results."

So, this is where we have been. Between independence and today, we have adopted and implemented several forms of development plans and the conclusion is that more work is required to enable us to get the results that align with our aspirations.

The discussion of the present situation is broken into two parts for proper perspective and in recognition that since the onset of the millennium, the world has experienced at least one major shock to the global economy, the great recession. The first part of the discussion focuses on the state of the African economy at the dawn of the millennium, specifically at 2000. The second part reflects the state of economic affairs post-great recession and up till 2015. A discussion of our present situation therefore suffices.

## **HERE AND NOW**

### **Appearance of Growth**

Depending on how and where you look, Africa is growing. The continent's population, which is currently more than a billion and growing, is overwhelmingly young at a time when populations in other continents are shrinking and getting older. Harvard's Center for International Development (CID) reports that three of the ten projected highest growing economies over the next decade are African; Uganda, Egypt, and Kenya in that order (CID, 2018). Based on this, one would be forgiven for thinking that the economic scenario in the continent is now picture perfect, but the CID researchers have also clearly noted that after a decade of growth, driven by record oil and commodity prices, the landscape has shifted in favor of more diversified economies and so in sub-Saharan Africa, growth is shifting eastward from commodity-driven West Africa to East Africa where labor has shifted out of farming into limited manufacturing sectors.

They also note that this is far from being an industrial revolution because structural change has been partial and piecemeal across these east African economies. It is anybody's guess as to how timely this must be: a precursor of an industrial revolution has finally arrived in east Africa! In concluding the report, the CID states that "the countries at the top of the growth list are also some of the world's poorest." It is easy to have an appearance of growth when starting from a lower income base, but what truly is the current state of the economic fortunes of most of the countries within the continent? Has there been meaningful and significant growth in wealth since the turn of the millennium?

A better picture of the state of things in Africa since the 2000s has perhaps been captured by the World Bank reports on the wealth of nations. This paper relies heavily on two of these reports (Where is the Wealth of Nations, 2006, and The Changing Wealth of Nations, 2018) to draw inferences on the extant situation in the continent for the following reasons:

1. The World Bank reports conform with the specific evaluation of the significance of using wealth estimates as complements to GDP in tracking the economic situation of nations;
2. The World Bank is authoritative and authentic in their capacity to harness and analyze data; they occupy a vantage position that no other institution involved in tracking global economic affairs can compare with;
3. Specifically, a comparative analysis of the 2006 and 2018 reports highlights the trend whether positive or negative that the economic fortunes of Africa have taken over the past decade. They also enable an examination based on the two periods mentioned earlier; at year 2000, and post-recession.

### **Reality of Non-Growth: Dawn of the Millennium**

The current picture of the situation of African economies is starker than the Harvard CID 2018 report presents. By the year 2000, the estimates of total wealth—produced, natural, and human and institutional capital—indicate that human capital and institutional values, measured by the rule of law, constituted the largest share of wealth in virtually all countries. Natural capital constituted a quarter of total wealth in low income countries, greater than the share of produced capital. See Table 1 (The World Bank, 2006) for more details. Cropland and pastureland constituted a whopping seventy percent of this natural wealth. See Table 2 for more details. For such countries to sustain development, they had to find ways to manage their ecosystems and natural resources while hopefully building their infrastructure and human and institutional capital. Strikingly, in the years immediately preceding 2000, the per capita total and natural income of low-income countries had declined. If growth was essential to meeting the Millennium Development Goals by 2015, and if mining and forestry/fisheries depleting based growth is illusory, then meeting the MDGs by 2015 would be far-fetched.

**TABLE 1: SHARES OF TOTAL WEALTH IN LOW-INCOME COUNTRIES, 2000**

<b>Form of Capital</b>	<b>Share (%)</b>
Intangible	58
Natural	26
Produced	16



**TABLE 2: SHARES OF NATURAL WEALTH IN LOW-INCOME COUNTRIES, 2000  
(OIL STATES EXCLUDED)**

<b>Form of Asset/Resource</b>	<b>Share (%)</b>
Cropland	59
Pastureland	10
Subsoil	17
Timber	6
Nontimber Forest	2
Protected Areas	6

To get a more complete picture of the African economic situation, it is imperative to juxtapose it with that of the rest of the world. The World Bank report, “Where is the Wealth of Nations: Measuring Capital for the 21<sup>st</sup> Century” (2006) was a result of data collection and analyses from about a hundred and twenty countries around the world. The report found that the composition of wealth varies considerably by region and particularly by level of income. Tables 3 and 4 below highlight the Total Wealth, and the Natural Capital respectively across the world in 2000.

**TABLE 3: TOTAL WEALTH, 2000 IN \$ (@NOMINAL EXCHANGE RATES) PER  
CAPITA AND PERCENTAGE SHARES (OIL STATES ARE EXCLUDED)**

<b>Income Group</b>	<b>Natural Capital</b>	<b>Produced Capital</b>	<b>Intangible Capital</b>	<b>Total Wealth</b>	<b>Natural Capital Share</b>	<b>Produced Capital Share</b>	<b>Intangible Capital Share</b>
Low-income countries	1,925	1,174	4,434	7,532	26%	16%	59%
Middle-income countries	3,496	5,347	18,773	27,616	13%	19%	68%
High-income OECD countries	9,531	76,193	353,339	439,063	2%	17%	80%
World	4,011	16,850	74,998	95,860	4%	18%	78%

\*OECD: Organization for Economic Cooperation and Development

**TABLE 4: NATURAL CAPITAL, 2000 IN \$ PER CAPITA (OIL STATES ARE EXCLUDED)**

<b>Income Group</b>	<b>Subsoil Assets</b>	<b>Timber Resources</b>	<b>Nontimber Forest Resources</b>	<b>Protected Areas</b>	<b>Cropland</b>	<b>Pastureland</b>	<b>Total Natural Resources</b>
Low-income countries	325	109	48	111	1,143	189	1,925
Middle-income countries	1,089	169	120	129	1,583	407	3,496
High-income countries	3,825	747	183	1,215	2,008	1,552	9,531
World	1,302	252	104	322	1,496	536	4,011

It is clear from the report that certain assets in the portfolio are finite and exhaustible. Such assets are only valuable to the extent that the rents accrued from them can be transformed through the investments of the rent receipts. For example, there are no sustainable diamond mines, but there are sustainable diamond-mining countries. Some other assets are renewable and can be manipulated into sustainable income streams. Overall, it is very possible to transform one form of wealth, e.g., diamonds into others, e.g., buildings, roads, machines, and most importantly, human capital.

The wealth estimates can be further fleshed out as the World Bank report has done. Using the perpetual inventory method (PIM), the result confirms that while the wealthy nations are predominantly European with the United States and Japan, the ten poorest countries were all from sub-Saharan Africa. See Tables 5 and 6. Note that produced capital is the sum of machinery, equipment, and structures while natural capital is the sum of nonrenewable resources (including oil, natural gas, coal, and mineral resources), cropland, pastureland, forested areas (including areas used for timber and nontimber assets), and protected areas. Intangible capital is the difference between total wealth and the sum of produced and natural capital.

**TABLE 5: TOTAL WEALTH OF TOP 10 COUNTRIES, 2000**

<b>Country</b>	<b>Wealth per capita (\$)</b>	<b>Natural Capital (%)</b>	<b>Produced Capital (%)</b>	<b>Intangible Capital (%)</b>
Switzerland	648,241	1	15	84
Denmark	575,138	2	14	84
Sweden	513,424	2	11	87
United States	512,612	3	16	82
Germany	496,447	1	14	85
Japan	493,241	0	30	69
Austria	493,080	1	15	84
Norway	473,708	12	25	63
France	468,024	1	12	86
Belgium-Luxembourg	451,714	1	13	86

**TABLE 6: TOTAL WEALTH OF BOTTOM 10 COUNTRIES, 2000**

Country	Wealth per capita (\$)	Natural Capital (%)	Produced Capital (%)	Intangible Capital (%)
Madagascar	5,020	33	8	59
Chad	4,458	42	6	52
Mozambique	4,232	25	11	64
Guinea-Bissau	3,974	47	14	39
Nepal	3,802	32	16	52
Niger	3,695	53	8	39
Congo, Rep. of	3,516	265	180	-346
Burundi	2,859	42	7	50
Nigeria	2,748	147	24	-71
Ethiopia	1,965	41	9	50

The wealth estimates indicate that the prominent form of wealth in the world is intangible capital. Not only is this the case, it is strikingly so. Almost 85% of the countries sampled have an intangible capital ratio of total wealth that exceeds 50%. Among the poor countries, the share of natural capital is greater than the share of produced capital. Excluding the oil exporting countries, cropland and pastureland constitute the largest share (almost 70%) of their natural wealth.

While the share of natural capital in total wealth tends to fall with income, the share of intangible capital rises, and this is evidenced by the fact that “rich countries are largely rich because of the skills of their populations and the quality of the institutions supporting economic activity.” The glaring conclusion therefore must be that human capital and other intangibles play a significant and major role in economic development and specifically, wealth maximization.

This was the conclusion based on the assessment of the economies at 2000. The World Bank Group has recently released an updated report on the state of the world economies, *The Changing Wealth of Nations, 2018* conducts the analyses with data including the period up to 2015. The discussions in the next sub-section rely on the World Bank 2018 report.

### **Reality of Non-Growth: Fifteen years into the Millennium**

Global wealth grew significantly between 1994 and 2015. In terms of wealth, middle-income countries closed the gap between them and the high-income countries largely due to the rapid growth in Asia. More than twelve low income countries grew into middle income category due to their abilities to invest their rent collections from natural resources into infrastructure, education, and health which increases human capital. Unfortunately, this is where the good news ends. Some low-income countries, mostly in sub-Saharan Africa experienced declines in their per capita wealth because rapid population growth outpaced investment. During the more recent ten years of the period reviewed, the percentage of people living in poverty escalated in twelve countries.

Table 7 (The World Bank, 2018) below summarizes some of the findings of the study as submitted in the World Bank 2018 report. *A quick note: having found a more sophisticated method to conduct the study, specifically how to track human assets, the report reclassified intangible assets and now used the term Human Capital.*

Here are the major highlights:

- Even though natural capital in high income OECD countries was only 3%, theirs was still three times that of low-income countries;
- The share of global wealth held by low-income countries mostly in sub-Saharan Africa barely moved from less than a percent throughout the period 1995-2014, even as the share of world population grew from 6% to 8%;
- Natural capital remained the largest component of wealth in low-income countries;

Perhaps the most striking finding from the study is the significance of human (intangible) asset to total wealth and its growth. This point is central to the argument set forth in this paper.

**TABLE 7: WEALTH, BY TYPE OF ASSET AND REGION, 2014**

Type of Asset	Low-income Countries (%)	Lower-middle-income Countries (%)	Upper-middle-income Countries (%)	High-income Non-OECD Countries (%)	High-income OECD Countries (%)	World (%)
Produced Capital	14	25	25	22	28	27
Natural Capital	47	27	17	30	3	9
Human Capital	41	51	58	42	70	64
Net Foreign Assets	-2	-3	0	5	-1	0
Total Wealth	100	100	100	100	100	100
Total Wealth, US\$ billion	\$7,161	\$70,718	\$247,793	\$76,179	\$741,398	\$1,143,249
Total Wealth per capita	\$13,629	\$25,948	\$112,798	\$264,998	\$708,389	\$168,580

So far, it has been shown that the national development plans, and its newer form, the comprehensive development plans formulated and instituted by most African nations have done little to nothing to improve the wealth situation of most parts of the continent since decolonization. The significant and impactful role of intangible/human assets to the creation and maximization of wealth among nations has also been shown under the themes of where the continent has been, and where the continent is now. Having laid this premise, the more important aspect of this paper suffices: to offer suggestions on where the continent should be headed; to justify the strategic recommendation of the African citizen as crucial to the growth aspirations of the continent; and hopefully, to make a connection between innovation driven entrepreneurship and the pre-colonial ethos of the pioneering African citizen.

## **INNOVATION ECONOMICS: DO WHAT WE DO BEST, TRADE FOR THE REST**

### **The Way Forward: Innovative Entrepreneurship**

The word Innovation has become ubiquitous in the 21<sup>st</sup> century. Sadly, it has often been ill-defined (Courvisanos & Mackenzie, 2014). Courvisanos & Mackenzie, 2014 define innovation economics as a part of economic theory that makes the argument about economic development being the result of appropriated knowledge, innovation, and entrepreneurship. This innovative entrepreneurship activity is captured within an institutional environment of systems of innovation. It is presented as different from other branches of economics including mainstream neoclassical theory which views capital accumulation as the fundamental driver of economic development. Whereas the socio-economic world in the innovation economics paradigm operates as an open and complex system with the capacity for adaptation, the socio-economic world in the neoclassical economy functions as a closed system with a tendency toward mechanical equilibrium.

Organizations are increasingly being tasked to be innovative as a condition for gaining sustainable competitive advantage. The concept of Innovative Economics has become imperative in its emphasis on creativity as a precondition for economic success. If it is useful for organizations at the discrete level, it should be useful for nations, especially African economies at the holistic level.

For sure, the quickest way to create and maximize wealth, and therefore improve the gross domestic product of African economies is to provide work for every hand that is capable and willing. This paper and discussion have sufficed because so far, this has not been done. As bleak as the current situation looks, there is hope for the future, but the steps to be taken must be calculated prior and must be tethered to the most feasible and potentially impactful rationale. Having demonstrated the significance of human (intangible) assets to the fortunes of nations, it goes without saying that any recommendation for future corporate action by African countries must involve the adoption of innovation economics and primarily therefore, place the role of a robust level of human assets at the center.

The operationalization of the human asset in the economy is manifested in the way citizens can use their ingenuity, expertise, knowledge, and skills to create and or boost the capacity for creating

jobs. High income countries thrive on their ever-burgeoning middle class who are mainly employed in small and medium sized enterprises (SMEs). Low-income countries struggle in this regard because of a diminished capacity to increase their stock of SMEs. This paper suggests that the resolution of this is for the continent to redirect emphasis from development plans that focus on the plan and bureaucratic arrangements set up to implement them to empowering the citizens to become innovative entrepreneurs.

If an entrepreneur is the person who designs, launches and runs a new business, and the innovator is the person who introduces new ideas; original and creative, then an innovative entrepreneur is the person who starts new businesses anchored on original and creative thinking. In the context of present-day Africa, for African nations to create and maximize wealth grow their economies rapidly enough to escape poverty, they have to spurn as many innovative entrepreneurs as there are people. In other words, a mere emphasis of entrepreneurship is inadequate. Innovative entrepreneurship must be the mantra if the region must achieve the goal of poverty eradication as the first quarter of this century lapses.

This paper argues that innovation is crucial to the push for African entrepreneurship because:

1. It enables resourcefulness and creativity in designing home-grown solutions to African problems;
2. It underlies the concept of “creative destruction” or ‘industrial mutation,” the idea that newer and smarter processes emerge to extinguish older ones;
3. It hearkens to the prescriptions made by Adam Smith in the Wealth of Nations, do what you do best, and trade for the rest.

Makhtar Diop, the World Bank Vice President for Africa agrees. Here is what he said in his speech at the Institute of South-South Cooperation and Development in Peking University, Beijing China in 2017.

But right now, across the developing world, there simply aren't enough jobs for the young people coming out of school, regardless of the quality of the education. Low- and middle-income countries around the world will need 520 million new jobs for youth coming out of school by 2030, and our current estimates are that 460 million will be created. All things remaining equal, that means 60 million young people without jobs. Within Africa, more than 50 percent of employment will still be in agriculture as of 2020. Currently, agricultural jobs pay poorly due to low productivity, which suggests that workers don't have promising job alternatives. This means that new jobs will need to be created (emphasis his). Currently, a lot of that job creation looks like the creation of microenterprises, small businesses that employ just one or two people. We need more. And the way to create more is through innovation. Innovation is absolutely key to African stability and growth in the coming decades (emphasis his).

Diop notes further that it would amount to a massive loss of opportunity if developing countries hesitate to invest in innovation proportionately when compared to wealthy countries. Drawing a parallel with Norway, Diop concludes that nations desiring to prosper must build on the sectors where they have comparative advantages, adopt and adapt innovation rather than original development. In other words, low-income countries are advised to do what they do best, and trade for the rest.

The question that suffices at this point, whenever innovation is mentioned concerning Africa and Africans, is whether we are endowed with the intellect and capacity to innovate, to create new knowledge, new processes, new products, and new technologies. This paper suggests that not only does this question misrepresent the history of Africans, it is dubious in its inherent design to consistently position the African citizen in a place of self-doubt, and continuous reliance on the technologies and knowledge of developed countries. If the land cannot be colonized, why not the mind. As Fourchard (2011: 247) puts it: “considering Africa’s cities as dysfunctional, chaotic, failed, informal, or not globalized works to retain the Western city as the paradigmatic model against which all others are to be assessed.”

The next sub-section draws on historical perspectives and evidences to locate the African citizen as a contemporary thinker and doer, capable of invention and innovation in the 21<sup>st</sup> century and beyond.

### **African Citizen as Pioneer: A Look Back in Time**

Killick (2015) states that there is evidence for past African inventiveness in technology. The question for him was why so few of these inventions spread widely in Africa; why did they not become innovations in the form of the steam engine, the canal networks, or electric lighting in Europe and the Americas?

To answer this question, based on his understanding of world literature on the history of technology, Killick suggests that the rates of technological innovation over the last 8000 years have been strongly correlated with three factors. The most important of these being population density. “Dense populations must be fed, clothed, housed and supplied with tools, and thus high population density promotes the spread of innovations in agriculture and in craft technologies. The second factor, contingent upon the first, is the presence of large towns and cities. Urban populations must have everything brought to them, which promotes innovations in transportation and in the scale of production, which drives innovations in machinery, factories and alternative sources of power. The third factor is literacy, which promotes the diffusion of ideas and the rapid spread of innovations” (Killick, 2015: 315).

According to Killick (2015), the European trans-Atlantic slave trade and the Islamic slave trade by land to North Africa was the major factor in the inferred stagnation of African population during this period. As Nunn (2008) has shown, the long-term effects of the slave trades are still with us; those areas of Africa from which the largest number of slaves were exported across the Atlantic

still have significantly worse average GDPs in 2000 than those that were barely affected by the trans-Atlantic slave trade.

So, there is little doubt that historically, the progress toward indigenous technological advancements in Africa, especially the sub-Saharan region would have been gravely thwarted and distorted by the slave trades. The effects of these were so devastating that in the 1820s, Georg Hegel wrote that when most European nations apart from Portugal had abolished (or were in the process of abolishing) slavery, European characterizations of Africans south of the Sahara became slightly reframed. Africans were gradually recast from whatever impressions of them that had existed centuries previously to that of unfortunate child-like subjects who needed protection from the (largely Islamic) remnants of the slave trade.

In addition, Barbier (2011) informs that the frontier of the industrial world was driven outward in the 1870s due to the combination of surplus capital and the need to acquire precious natural resources and new markets.

The combination of these factors led to the colonial annexation of the continent, which was formally divided among the European powers at the Berlin Conference of 1884/85 (Iliffe 2007). The expansion of Europe's imperial footprint over the southern hemisphere also brought an expanded reach of their technology. While this technology acquired symbolic value within the colonial empires, it showcased the colonizer's superiority and created legitimacy of occupation as it supposedly contributed progress and civilization (Adas, 1989). The final nail on the coffin of any possibility for an African led progress toward its own modernity or technological advancement was in place.

In his book, "Transient Workspaces: Technologies of Everyday Innovation in Zimbabwe," published by MIT Press in 2014, Clapperton Mavhunga called for a historical rethinking about the meaning, prevalence, and application of technological innovation in Africa. Using historical anecdotes and accounts, he challenged the general narrative of technology transfer from the haves to the have-nots. Using an example of the border region where Zimbabwe, Mozambique, and South Africa meet, Mavhunga recounts the ingenuity of indigenous hunters who had for centuries made and used an impressive array of tools. Using the example of the hunt as a mobile space for work and education, Mavhunga challenged the idea that technology can only come from outside Africa. Mavhunga's historical accounts stem from southern Africa but similar stories abound across the length and breadth of the continent. Historical accounts from the Mali Empire, to the Sokoto (Fulani) caliphate, to the great Benin kingdom show evidence of a people that were highly inventive and innovative.

## CONCLUSION

From the preceding discussions, it has been shown that: the African continent is endowed with a burgeoning youthful demographic; her antecedents prior to slave trade and colonization speak of a people with the capacity for innovation; and the continent is endowed with reserves of initial wealth in the form of natural assets.



In conclusion, this paper recommends that those charged with the responsibility of managing the continent realize the strategic impact of adopting innovation economics and doing the following:

1. Mixing up the endowments mentioned above (youth, innovative capacity, and natural resources) efficiently to meet the challenges posed by Killick's third factor, literacy; and Mavhunga's admonition on the rethinking of the meaning, prevalence, and application of technological innovation in Africa. Specifically, the citizen has to be acknowledged as the fulcrum for economic development. To this extent, direct investments in African youths in the area of education and healthcare should be emphasized in order to improve literacy and boost their productive capacity. These investments should be made using the receipts from the trade of natural resources. With regard to education, it should be the form that seeks to inculcate the capacity for innovation and entrepreneurship; it must emancipate the youths from reliance on foreign technologies and instill in them the trust and confidence in their own capacities to provide home grown solutions to problems. With time, these solutions will ultimately be scaled up to a global market.
2. In connection with the above, the public and private sector leadership in the continent must begin to de-emphasize the reliance on complex development plans that require central coordination and bogus bureaucracies. So far, it has been shown that the development plans and other forms of it have had very negligible impact on economic growth across the continent. In a widely reported news comment in an online news platform, Sahara Reporters on October 12, 2018, the World Bank President, Jim Yong Kim was reported to have said that the World Bank was wrong to have advised Nigeria, and Africa as a whole to focus on investing in hard infrastructure instead of human capital.
3. Programs that recognize and empower every citizen to be innovative entrepreneurs should be encouraged in order to hearken back to the basics as propounded by Adam Smith in the *Wealth of Nations*. The concepts in Smith's treatise have remained relevant after centuries because of the simplicity of its underlying concept: do what you do best and trade for the rest. The African continent will be better off by striving to conform to this simple principle.

It is pertinent to mention at this point that the discussions and recommendations offered in this paper represent at best a limited aspect of the overall framework for economic growth. It should be taken as a complement and or supplement to other blueprints available in the discourse space for African economic growth and development.

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# **SHIP TO SHORE CONNECTIVITY: TRENDS, OPPORTUNITIES, AND ISSUES**

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## **ABSTRACT**

Shipping firms constantly look for ways to improve their cost structures. Advanced information and communications technologies are providing the latest opportunities in this effort. Some of the aspirations in the area are centralized command and control, and autonomous vessels. Unfortunately, advances in the architecture of maritime vessels can create serious cost and management problems for maritime ports. This paper looks at current trends in ship to shore connectivity, future opportunities in the usage of information and communications technologies in the management of maritime vessels and ports, and issues that are arising or could arise with the implementation of these advancements.

## **INTRODUCTION**

The maritime industry is continuously looking at new and innovative ways to improve their operations. With the advances in telecommunications, ship to shore connectivity has improved to the point where remote operation of vessels is becoming a reality. The potential associated with these new technologies represent significant opportunities for the maritime industry in costs, cargo handling, safety, etc. These technologies also present threats such as; spoofed automatic identification system (AIS) signals; remote control systems ~~experienced~~ attacks that disabled, disrupted or destroyed Dependent Navigation Systems (DNS); hacked systems; unintended impacts on the environment; and, the industry remains susceptible to human error at the most basic level (e.g., the 2018 collision between a United States (U.S.) naval vessel and commercial freighter in the South China Sea). Furthermore, these advances create new issues for port management, vessel design and operations, crew management, and navigation.

## **TECHNOLOGICAL TRENDS IN MARINE INFRASTRUCTURE**

The maritime industry provides one of the most effective modes of transportation, accounting for 90% of global cargo/trade. As such, it has played a major role in the expansion of business and

trade throughout recorded history, having a significant influence on the world economy. For centuries, shipping companies have transported cargo in every form effortlessly. However, with the growing population, imports and exports have increased exponentially in the global markets. This escalation is causing maritime companies to adopt new technologies that provide faster and more efficient trade service. For example, the increase in trade requirements (i.e., more cargo to transport) is causing ship builders to manufacture larger ships with more cargo capacity, while causing shipping companies to introduce advances like blockchain to track and secure the cargo in transit. Much of the new technology trends for ship to shore communications is driven by the need to support the advances fostered by builders and shippers.

Advancements in technology have introduced a number of techniques that have the potential for upgrading the overall operation of the shipping industry. These advancements are gradually improving the industry with better and more advanced machinery and communication tools for making a sailor's life easier. These various technological advancements in the marine industry have affected marine infrastructure, navigation aids, salvage and firefighting support, security systems, and search and rescue facilities.

## **Robotic Automation**

Growth in the use of robots has become quite common in every sector (Zhang, Marani, Smith, & Choi, 2015). In the shipping industry, robots are gradually being used to aid in tasks such as packing, delivering, inspection, firefighting, etc. Given that robots introduce an effective, continuous mode of operation in contrast to human resources, the shipping industry anticipates heavy reliance on robots for every function (Agrawal & Dolan, 2015). Efforts are being made to enable robots to perform manual tasks such as loading and moving cargo. Robotics can potentially be used to perform maintenance and firefighting tasks, while artificial intelligence (AI) can be utilized to locate and navigate ships (Ono, Quadrelli, & Huntsbe, 2014). The combination of these two technologies can detect and eliminate threats of an attack as well.

Due to limited space onboard maritime vessels, the size of robots poses a challenge. New types of robots, called 'mini-robots', are being fitted with sensors to identify and record shipping operations data. In the next few years, advances in robotic automation will considerably reduce manpower aboard.

## **Autonomous Ships**

Waterborne (2015) defines an 'Autonomous Vessel' as a "next generation modular control systems and communication technology that will enable wireless monitoring and control functions both on and off board. These will include advanced decision support systems to provide a capability to operate ships remotely under semi or fully autonomous control". For a vessel to operate under these conditions extensive sensor systems would be needed to detect problematic situations such as unexpected objects in the seas, dangerous weather conditions, and/or potential collision dangers.

The rationale for these types of vessels is that they would require little human supervision or intervention during voyages; thereby increasing the efficiency of ship operations as well as enhancing the sustainability of maritime transport as a whole. From an economic perspective, unmanned vessels would be less costly to operate. In 2011, the average cost of ship operations for bulkers ranged between 31% and 36% of total costs (Gardiner, 2011). From an ecological perspective, there is a tradeoff between bunkering and chartering costs. By slowing transit speeds from 16 knots to 11 knots, bunkering costs could be reduced by approximately 46%, while chartering cost would increase by only 38% (Rodseth & Burmeister, 2012).

## **Autonomous Systems**

Remote and autonomous systems in shipping are gaining acceptance because of their capability to deliver goods without any human interaction. Surface, underwater, and air-based vehicles are being employed for monitoring, inspecting, retrievals, and other types of activities. These autonomous systems utilize the latest, advanced heat mapping and material detection technology in the execution of tasks, thus eliminating human effort. Potential benefits associated with autonomous systems include (Rolls-Royce, n.d.) reductions in potential for human error; more efficient use of space in ship design; and more efficient use of skilled crews. Furthermore, unmanned cargo vessels would not need superstructure supporting human activities, thus creating more cargo space.

## **TRENDS IN INFORMATION AND COTMMUNICATION TECHNOLOGIES (ICT)**

Today's maritime communication solutions have evolved from analog devices to digital (Chatzigiannis, Gibson, & Singh, 2013). Line of sight communications have been enhanced with satellites. Voice communication is being replaced with computers and the Internet. Logistics are becoming more complex increasing the need to digitalize information streams. Some of the potential benefits are optimization of existing infrastructure; reduced need for additional capital investment; possible reduction or elimination of unnecessary (empty) transport; increased collaboration; and increased comparative advantage for both ports and shippers from big data analytics.

The trend of forcing cell phone companies to sell access by the gigabyte has begun to transfer to maritime services. Due to the threat of crew broadband data usage overwhelming a vessel's data network, provider services for data access at sea need to address increasing operational demand. The solution of simply adding bandwidth capacity and data speed is not enough, because history shows that eventually there will be new ways of consuming capacity.

Ship operators are beginning to demand greater transparency in how data is being used and how much is needed. This transparency will provide owners and operators with a better understanding of usage trends.

Research shows that maritime user applications requiring access to communications systems can be divided into six main areas: safety and security; vessel operations; regulations and policy; tracking and monitoring; crew welfare; and, shared situational awareness (Plass, Clazzer, Bekkadal, Ibnyahya, & Manzo, 2014).

## **The Growth of Sensor Technology**

Advancements in sensor technology have broadened technological capabilities. Since the introduction of sensors, the need for manually checking equipment onboard ships has been greatly reduced. The ability to connect equipment to sensors through wireless connectivity has enabled crews to keep accurate tabs on a machine's working condition, the intervals between required maintenance activates, and the overall monitoring of vessel operations. In addition, when sensors are combined with machine learning and artificial intelligence, shipboard data can be analyzed remotely, and alerts can be sent out immediately when there are aberrant behaviors in operations or when maintenance is required.

## **Internet of Things (IoT)**

IoT is an ecosystem of open-source data that ships can leverage for various use such as acquiring weather data for navigation, or tapping into a public camera to view the port area. Using a global positioning system (GPS), a cloud-based database, and a wireless network, data collected by various sensors, robots and other devices onboard the ship can be accessed, analyzed, and acted upon if necessary. As this technology matures, shippers will eventually be able to remotely control onboard systems critical to autonomous vessels, shipboard optimization, and other functionality. Currently the advantage of IoT is in keeping track of all devices and shipments. This allows the shipping industry to provide better customer service with information about the location, time of arrival or delay in shipment.

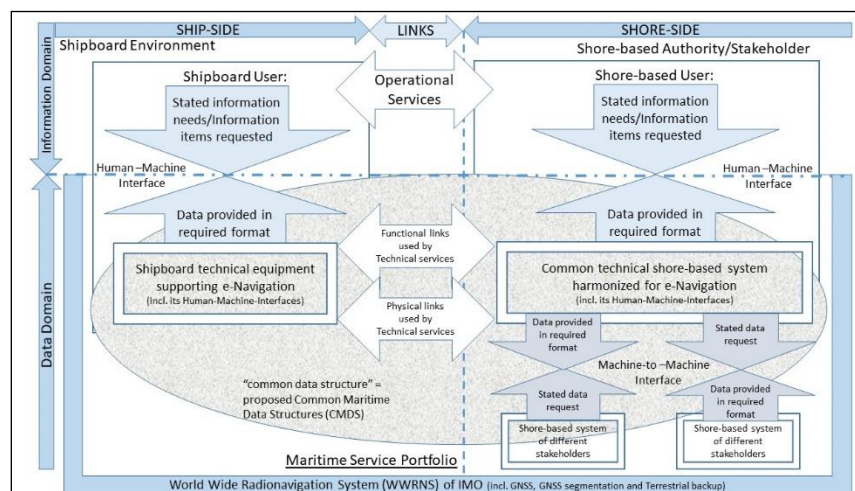
## **Navigation Aids**

Navigation aids have been utilized for centuries to help ships sail safely across oceans, avoiding hazards and other dangers. The evolution of navigation aids is increasingly reliant on information technology for the elimination of human errors in transmission and improving efficiency. Technology has played an important role from the very beginning from the development of nautical charts, lighthouses, beacons, and buoys, to GPS, electronic charts display and information systems (ECDIS), satellite based aids, automatic identification systems (AIS), etc.

These advancements are making navigation easier and more effective. In addition to making navigation safer, these virtual systems are easily installed and have lower maintenance costs than physical navigation aids. Unfortunately, tying everything to one electronic backbone has made unauthorized remote access and attack much easier.

The International Maritime Organization (IMO) defines e-navigation as “the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment” (Plass et al, 2014, p. 5). The continued evolution of e-Navigation will require higher digital data exchange and bandwidth capabilities than is currently available. The specific user needs and potential e-navigation solutions proposed by the IMO are shown in Figure 1 below, which for the sake of simplicity does not show the operational and technical interactions between different shipboard environments. The IMO project has identified some possible future developments in the field (Plass et al, 2014):

- Improved harmonized and user-friendly bridge design that integrates bridge equipment and navigational information, and presents the information in graphical displays;
- Improved reliability and flexibility of on-board position, navigation and timing (PNT) systems;
- Improved shore-based services through means of standardized, automated ship-to-shore reporting.
- Improved access to search and rescue (SAR) information;
- Improved communication of vessel traffic system (VTS) information.



**FIGURE 1. POTENTIAL E-NAVIGATION SOLUTIONS**

## Search and Rescue

Even with all of today’s modern advancements, sailing the seas is hazardous; ships can be lost, hijacked, or wrecked. In such cases, ICT has proven to be invaluable for running search and rescue

operations. The global maritime distress and safety system (GMDSS) provides maritime authorities status on vessels in distress. Ship-to-shore security alerts, satellite-based location detection, and digital calling are just some of the means for sounding distress alerts. Transponders and handheld personnel location detectors can be used to detect the position of ships and sailors in distress with extreme accuracy.

Given the real-time nature of such capabilities along with the establishment of virtual boundaries for early notification, SAR activities are transitioning from reactive to proactive. Prevention and mitigation strategies along with training are reducing the number and impact of events. With improved connectivity, simulators can enhance training activities and improve crew reaction times and decision-making capabilities.

### **Crew Welfare and Safety**

The modern seafarer is demanding better communication connections to home; thus, ships are providing access to social media, news, movies, television entertainment, and music while at sea. They also want better training and professional development, as well as better working conditions.

Lukas (2010) notes that, “ranging from marketing and design over manufacturing support to familiarization, training and maintenance assistance, there is no phase in the lifecycle of a ship or seaborne structure that would not profit from 3D modelling, simulation, virtual/augmented reality or computer vision.” Other areas that could benefit from improved ship to shore connectivity are:

- Crew management may be eased through the provision of an online scheduling system, permitting crews to know and manage their crewing schedules in advance;
- Professional development may be achieved through Computer-Based Training (CBT) that offers onboard testing for certification and career advancement;
- Gaming can be integrated with more advanced land-based simulators, advancing knowledge while reducing a crewmember’s landside time commitment. This benefit may be offset by reducing a crew member’s time with his or her family;
- Human resource management and quality of life needs may be automated, providing crewmembers the ability to address issues such as health insurance and remittance regardless of whether they are at sea or not.

Game engines can combine handling and rendering of 3D objects in an efficient way to simulate interaction and behavior. This mixture of gaming and simulation allows for interactive training (Wolfe & Crookall, 1998). One example of the usage of the game approach is the PC-based shipboard virtual fire-fighting application that is part of a blended learning course for basic fire-fighting (Deistung, Lukas, Sedlacek, & Kucha, 2008). Simulator based training has been used for decades to train aircraft pilots and nautical officers. One of the challenges in the development of simulations is the replacement of complex equations of motion with accurate approximations that



are solvable in real-time. This human-in-the-loop approach allows for the optimization of the simulated vessel (Smith & Cheok, 1998). Another challenge is the usage of real-time graphics in the simulation. This practice offers an extremely efficient approach for practicing the handling of complex technical objects (Ridan, Batile, Ribas, & Carreras, 2004).

## **Security Systems**

The maritime industry continues to face threats that have a harmful impact on crew, ship, and country. Some of the threats are piracy, hijacking, armed robbery, smuggling, narcotics, illegal migration, etc. In an effort to mitigate or eliminate these threats, new methods of enhanced security have been implemented. Advanced technologies contribute significantly in achieving this goal in several ways (SHM Shipcare, 2018):

- X-ray, gamma ray, and neutron scanners are used to detect explosives and drugs;
- Biometrics such as facial recognition, figureprint identification, iris/retina scanning, voice recognition, etc., provide safeguards in sensitive operational areas;
- RFID (Radio-frequency identification) tags, smart robotic underwater surveillance, and sensor-based controls are used to maintain security.

Security can generally be divided into two groups – physical protection systems and cyber security (sometimes referred to as information security). Within both of these groups there are four basic elements – detect, delay, response and mitigate. For the shipping industry, this includes both landside and onboard systems.

Bullets 1 and 2 are examples of detection that can be both landside and onboard. Delay mechanisms include electronic security fencing, slippery foam (denial system) and stun grenades—all non-lethal onboard systems. Response mechanisms include automated anti-boarding devices such as water cannons and razor wire canisters. Bullet 3 is a mish-mash of things with RFID and robots being detection, and sensor-based control (usually referred to as Process Control Networks) being detection, delay & response.

## **OPPORTUNITIES**

It is increasingly vital for maritime ships at sea to be able to communicate and exchange information with a shore network. Transferring files, database access, e-mail, web/intranet browsing or video conferencing, and other such services are all important facets of such information exchange. Currently, these activities are accomplished with satellite communications, which is expensive and slow. As vessels near the shore, alternate methods of communicating are typically faster and cost less than satellite-based services (Rolls-Royce, n.d.). Thus, as vessel designs and technology evolve, the land-based components supporting them must also evolve. In

addition, advances in telecommunications, automation, and vessel design will present opportunities for innovation in how ships are maintained, supplied, and crewed.

## **Automation**

The advancement of technology is providing port authorities with new and better methods of controlling port and terminal activities. By integrating technology into these activities, intelligent solutions for efficient control of traffic and trade flows through ports promises to increase port capacity and efficiency. This trend towards automation in process flows and operations conducted at ports is driving significant change in the way maritime trade is conducted.

Currently, many ports have integrated technology to some extent into their operations. Initiatives from government coupled with an exponential growth of maritime trade has gradually increased the number of smart, automated ports or mega-ports. These smart ports generally deploy cloud-based software to assist in creating operational flows that help the port to function smoothly. The degree to which ports have automated their operations differs, contingent on the capacity, location, cargo volume, and cargo economic value. The implementation of automation is occurring across port processes including; material unloading and cargo handling equipment, digitization of ship records, inventory management, infrastructure, vessel docking and maintenance, and more.

## **Big Data and Data Management**

Port information use is evolving beyond docking ships. Stakeholders within the port ecosystem are coming together to devise new data-driven processes and practices. As the maritime industry becomes more complex, a variety of agents, ranging from cargo and logistics companies, storage providers, rail and barge operators, trucking companies and original equipment manufacturers (i.e., sensor providers for pipelines, cranes, berths and roads) are exchanging information in real time.

Intelligent solutions and services are helping ports increase productivity and efficiency, as well as improve collaboration and information sharing between the port authority and its various stakeholders. These technologies generate large amounts of data in many forms and must be shared with many different port stakeholders. Examples include:

- The usage of real-time data in ship inspections: By coupling advanced sensor technology with small, autonomous vehicles inspection, speed can be increased saving time and money;
- Improved weather condition and water levels predictions: With accurate information on weather and water conditions, shipping companies can determine the best time to bring their ships into port, potentially saving money and time;

- Improved tracking and monitoring of resources: Real time information on the availability and operational efficiency of cargo handling machines such as cranes and trucks is essential to making good decisions on cargo handling and transfer;
- Regulatory compliance: Remote advanced communication of the condition of a ship, its crew and cargo, and port facilitates time-consuming processes such as Customs clearance, Coast Guard safety inspection, and security protocols mandated by the International Ship and Port Facility Security (ISPS) Code.

### **3D Printing Opportunities**

The evolution of 3D printing is driving manufacturers towards the goal of zero-inventory. Many ships are now incorporating 3D printing capabilities onboard. This impacts the ship directly allowing for the immediate printing of parts when breakage is encountered. It may eventually transform the way ships are supplied in the future – cargo streams will most likely transition to more shipment of raw materials rather than end products.

3D printing will likely reduce the need for original parts from OEMs. The degree to which it will reduce the quantity of items shipped is unknown. One factor that will affect the answer to this question is that, after an item is printed it still needs to get to where it will be applied, which means the volume of shipping is directly tied to the number of locations where 3D capabilities are located. As trade patterns alter, new opportunities will emerge to service new manufacturing requirements to ship materials out for recycling and refurbishment.

### **ISSUES**

Though technology is becoming more prevalent in shipping, it has not replaced manual involvement. It is important that technology be seen as a valuable tool to assist shipping operations and used accordingly. Technology, applied properly and updated frequently, can ensure a competent and competitive shipping industry in the near future. Even so, there are challenges yet to be mastered; these include the following.

#### **Data Management**

Data management includes data collection, data storage, and data processing. In today's data-rich world, making better decisions is not possible without good data management. For example, without rigorous data, it is least extremely difficult to perform reliable cost-benefit analysis, accurate forecasts, or make effective operational decisions within the maritime environment (Deistung et al, 2008). Advances in data collection and management offer the broadest, easiest, and most cost-effective method for advancing vessel operations and port management (Kenyon,

Neureuther, Zhou, & Goldsmith, 2018). Data management requires minimal capital expenditure, but offers significant returns to all parties. The absence of rigorous data makes it difficult to perform reliable cost-benefit analysis, develop accurate forecasts, or make effective operational decisions within the maritime environment (CMAIS, 1999). There are numerous articles that discuss supply chain practices related to enabling IT systems including vendor managed inventories, virtual integration, just-in-time purchasing, collaborative planning, forecasting, replenishment, and governance programs (van Hoek, 1999; Waller, Johnson, & Davis, 1999; Raghunathan, 1999; Wang & Wei, 2007; Caroline, 2018). Some of these solutions can certainly be applied to ship operations and port management. However, in order to adopt the best practices, it is crucial to identify the right data points and collection methods. Key data collection areas include, but are not limited to, asset movement (ships, trucks, cargo), asset environment (cargo content, cargo processing, customs clearance), and end user management (global supply chain).

One of the challenges going forward is not how to capture data but rather how to manage and leverage the information that has already been generated to create value (Caroline, 2018). With a data sharing solution, ports and ships could collect, combine, and analyze many sources of relevant information before a ship arrives at a port. Another challenge is the centralization and management of the information produced by the many stakeholders in the maritime industry (Wingrove, 2018).

These types of initiatives will increasingly rely on data sharing platforms and application programming interface (API) centric solutions for the linking of data from different sources, including shipping and logistics companies; weather, ship inspection, bridges and railway sensors; and the ports themselves.

## **Data Collection**

Data collection seems straightforward, but will encounter problems without a thoughtfully developed comprehensive collection plan. Two critical port management mistakes in data collection happened over the past decade in dozens of ports throughout the Americas, Africa, Asia, and the Middle East. The first mistake was collecting information only for a specific purpose because decision makers tend to think in terms of information rather than data (Kenyon et al, 2018). The data collection process should be focused on the gathering and measuring of information on targeted variables in a systematic fashion that enables one to answer relevant questions and evaluate outcomes. As such, data is an asset that supports decision-making. Allowing the questions and outcomes to dictate what data to first collect creates vulnerabilities in the knowledge comprehension of the individual(s) formatting the data limiting flexibility in addressing environmental changes.

For example, the Philippine Ports Authority (PPA) collects vessel traffic information for the express purpose of national port management and business development. To that end the PPA decided that the data required to meet their needs included the ship owner, the port of origin, the port of destination, the transit departure time, the arrival and duration times, the cargo description, and the cargo value. If other data was collected beyond the PPA's specific intent (such as a vessel description, crew identification information, and vessel routing), the data collected would be

available for other purposes such as port security. In fact, this new data could then be used to improve navigational safety and country marketability when the need arose (Kenyon et al, 2018).

The second mistake in data collection was that stakeholders collected information only within their own vertical functions (Kenyon et al, 2018). This produced stove-piped information cells, duplicated data collection efforts, and conflicting information. To overcome this issue, data must be collected and coordinated at the port management level, not at the individual stakeholder level. Unfortunately, this form of data collection is typically abandoned the moment the issues of proprietary information and business competitiveness are broached.

Representative of this issue (Kenyon et al, 2018), the Philippines Bureau of Fisheries and Aquatic Resources (BFAR) established a vessel monitoring system to track commercial fishing vessels. Administrative and operational practices and equipment were instituted to collect information specific to BFAR's requirements. While access to this output was granted to other port stakeholders, neither the data nor the equipment was applicable or compatible for other functions such as the tracking and monitoring of non-commercial fishing vessels.

In the private sector context, Philippine terminal operators such as International Container Terminal Services, Inc. (ICTSI) and Asian Terminals Incorporated (ATI) produce require raw data germane to the Port Community System (PCS). For example, ICTSI and ATI equally benefit from knowing the status and nomenclature of a ship that may visit both terminals. Present day industry practice requires each terminal operator to independently collect raw data. This results in cost duplication within the PCS.

## **Data Security and Information Privacy**

Hackers remotely taking control of systems is the new "hole in the fence" of port and vessel security. Though the use of various control systems and automation in operations will reduce the risk of human errors and increase the reliability of the system; technology also has a dark side.

As usage of the internet expands into shipping apparatus and operations, cyber security becomes of utmost importance. Management of this issue will force changes in operational policies, making regular testing and data audits a standard routine aboard the ships. As the scale of data to be captured and stored in secure servers for reference and analysis increases, vessel designers and port authorities will need to determine network infrastructure and equipment needs, the associated power and cooling requirements for that equipment, as well as space requirements.

Software and device developers need to ensure that appropriate security standards are maintained whenever new technology applications are developed. Ship operators and port authorities will need trained personnel to maintain and operate the equipment and networks. As cybersecurity and cyber-resilience become more important, port authorities will need to be prepared to deal with existing and emerging cyber threats from criminals, terrorists and enemy nation states intent on shutting down large pieces of the country's maritime transportation system. This preparation is not just technological; it is also cultural. Port and Vessel managements need to develop a risk-aware culture within their various organizations.

## **Scaling of Transportation**

The determination of the value of maritime transport is shifting away from scale toward the degree to which relevant technological advances are being leveraged (UNCTAD, 2018). As the nature of the shipping industry evolves, its infrastructure needs to change with it at a comparable rate. The size of ships, trains and trucks are expected to increase over the next 15 years. As vessels increase size and capacity, ports will need to increase channel depths, widen docks, and increase the strength and capacity of quays and cranes. As transshipment becomes more structural to the industry, the need for cooperation between ports will increase in order to secure optimal transport. These types of major infrastructural projects typically take up to 15 years to complete.

## **Autonomous Shipping**

The development of autonomous shipping holds great opportunities for the shipbuilding and shipping industries. But it will also require the development of new competencies before autonomous ships can become a commercially viable reality. Research must improve sensor technology, as well as the acquisition of high-resolution ranging data and instrumentation accuracy. Software development will play a very significant role in enabling situational awareness, a prerequisite for automated decision management.

Another concern is the operational availability of on-board machinery. Because immediate repairs will not be possible on an unmanned craft, the reliability of all mechanical and electronic components need to improve.

Furthermore, there exists no legal framework that governs the use of unmanned ships. Rules and regulations will need to be developed to avoid potential conflicts with international law before autonomous ships can operate in international waters. Because these vessels can travel great distances, well-trained crews who can respond quickly to any technical issue will need to be available at a moment's notice. If an unmanned vessel has a technical issue in the open seas, it can take days before it can be reached and the problem fixed. This would not be safe or economical.

## **FINANCING RISKS AND MECHANISMS**

Autonomous shipping is not without its risks. These include, "Cyberattacks, piracy, casualty management, vessel maintenance, assignment of liability and safety..." The primary way to deal with such risks is through marine insurance. However, the industry is struggling to deal with the paradigm shift of autonomous shipping (Smith K. , 2017). This shift has been described as "the biggest revolution in shipping since sail gave way to steam" (HFW, 2019). Autonomous shipping could also mean "the end of thousands of years of maritime law and risk management" (Morris, 2018).

Marine insurance, complex from the beginning, was also very profitable because, unlike life insurance, it is fairly easy to sell. According to Zelizer (1979), "Marine insurance was the first type to be established,

and it developed with ‘inconceivable rapidity,’ becoming so profitable ‘that it may truly be said to have laid the foundation of many fortunes in our country.’ As early as 1721, it was said to be ‘very much for the Ease and Benefit of the Merchants and Traders.’ In that year, John Copson opened in Philadelphia the first marine insurance office. The demand grew, and by 1750, offices operated in Boston, Philadelphia, New York, and other commercial centers. Marine policies were also being sold extensively by private underwriters. The Insurance Company of North America became the first incorporated marine office in 1794. By 1798, it was collecting nearly \$1,500,000 in premiums from Philadelphia alone.”

The complexity of marine insurance has long been recognized. Unlike life insurance or fire insurance, which both deal with single event types, marine insurance must indemnify “...against the loss of ship, goods, freight, anticipated profits, or any other insurable interest, through any of the numerous perils and adventures connected with navigation, such as the “perils of the sea,” fires, collisions, pirates, thieves, seizures and restraints, jettisons, barratry of the master or mariners, and all other perils, losses or misfortunes which might be assumed by the policy” (Huebner, 1905). Since complexity has always been at the heart of marine insurance, the industry should be able to deal appropriately with these new concerns.

One of autonomous shipping’s interesting wrinkles is that it shifts the risk from the crew on the ship to software developers. Jarle Fosen, loss prevention expert for marine insurer Gard, notes, “The root cause of most [crew related accidents] are issues such as fatigue, inadequate communication, lack of knowledge of the ship’s system and decisions based on incomplete information.” These risks, according to Fosen, have the potential to be reduced with autonomous shipping (Smith K. , 2017). However, Andrew Kinsey, a senior marine consultant with Allianz Global and Corporate Specialty, argues that “Removing the humans from the vessels does not eliminate the human error. It just moves the human error from the helm to the coder” (Morris, 2018). The recent problems with Boeing’s 737 Max navigational software have brought to light many of the risks involved with relying heavily on software solutions to navigational issues with “The future of the 737,” according to *The Wall Street Journal*, “rest[ing] on the [software] fix” (McCartney, 2019).

The liability of collisions at sea has until recently been the responsibility of shipowners. That changes when there is no crew on board because the liability shifts from the navigator to the software maker (Smith K. , 2017).

Cyberattacks on autonomous ships will inevitably happen. In fact, cyberattacks have been launched against GPS systems on manned vessels. Somali pirates use cyberattacks to hack in to onboard navigation systems so that they can “identify vessels in the Gulf of Aden carrying valuable cargo.” Marine insurance policies often exclude cyberrisk, which means shipowners should also carry separate cyberrisk insurance policies (Grasso & Hall, 2015). However, cyber insurance has not caught on quickly. Andrea Schlayer, a cyber underwriter for Munich Re, argues that marine underwriters can learn to understand cyber risks more readily than cyber underwriters can learn the marine underwriting industry. The risk from cyberattacks are difficult to quantify because they often go unreported. However, losses have been relatively small, but as shipping increasingly relies on software for navigation, such losses are bound to increase, and the current gap in cyber insurance will need to be addressed (Morris, 2016).

From a legal standpoint, the very definition of what constitutes a vessel is unclear with autonomous shipping. In fact, Stephen J. Harris of Marsh & McLennan Companies posits that “The legal complications of crewless vehicles are actually more complicated than the technology.” There is no precedence for dealing with a crewless vessel if it sails into the port of a nation that has no regulation dealing with the issues of autonomous shipping. Harris also wonders who would be responsible, “If an operator did everything fine but a system went down.” Even if the system’s designer accepts responsibility, “what matters,” according to Harris, “would be the flag state’s law in international waters and the local state’s law in territorial waters.”

As in many instances regulation significantly lags technology and must quickly catch up globally for mass autonomous shipping to reach its full potential (Morris, 2018).

## CONCLUSION

The maritime industry is facing many challenges ranging from economic contractions, overcapacity, rising freight rates, high fuel prices, piracy, environmental impacts, to labor shortages [24]. Innovation and technology can solve many of these issues. Governmental policies and behavioral changes can help with some of these issues. Regardless of the solution methodology, maritime transport is vital to everyone, and as such, solutions must be found.

As vessel designs evolve along with advances in automation technologies, the costs and productivity associated with maritime transportation will be greatly improved. In addition to these improvements, parallel improvements in ship to shore connectivity must also be achieved. Not only does improved communications and decision making improve both ship and port operations and safety, it is demanded by the marketplace.

The maritime industry plays a critical role in the world economy. With the advances in ICT, ship to shore connectivity has improved dramatically and has potential for further improvement. In the meantime, many challenges for ship to shore connectivity exist that must be resolved.

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