

Yemen and education:
Shaping bottom-up emergent responses around tribal values and customary law

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Final Preprint: Accepted 16 October 2018 to the International Journal of Comparative Education and Development, 2396-7404. To be published/in-print 2018.

Abstract

Purpose – The purpose of this paper is to draw from up-to-date reports that outline the current situation for Yemen in terms of education and the socio-political context, and to address this context with theory from the complexity science domain in order to propose practical recommendations.

Design/methodology/approach – The paper outlines highlights from the current situation in Yemen, namely, the challenges presented by conflict, and international engagement in conflict, and offers an appraisal of key factors pertaining to education and progress made in this arena in recent years. A focus is made on tribal groups as a starting point for bottom-up emergent engagement, and complexity science is suggested as a theoretical domain to draw from to conceptualise how to enact this.

Findings – A discussion of how complexity science could be meaningfully applied to the case of education in Yemen is presented, along with seven recommendations for the focus of future international aid interventions in Yemen.

Originality/value – At this time, there are few, if no, other works that have been found that have considered the case of education in Yemen in this way from the perspective of a bottom-up emergent engagement with tribes as a way of leveraging the values-based system of tribal customary law in order to address sustainability development goals, literacy, integration in digital society and education as a means of approaching these issues.

Keywords: Yemen, Education, Conflict, Tribes, Complexity science, Customary law

Paper type: Conceptual paper

“To the oppressed, and to those who suffer with them and fight at their side” (Freire, 1970)

This paper focusses on the complex, socio-political context of education as a humanitarian and economic issue in Yemen, drawing from UNESCO, and other recent, politically analytical reports, and proposes a conceptual perspective to be taken grounded in complexity science and the work of Freire. An attempt has been made to present a new approach exploring the context of education in Yemen, suggesting what elements of complexity science could apply to the Yemeni situation as a starting point for an approach to intervention. This conceptual review paper,

based on a domain which suffers from a paucity of literature as applied to Yemen, argues that such a perspective would more greatly enable a bottom-up emergent response for social, economic and potentially sustainable environmental development to take place, inclusive of tribal entities within Yemen as part of an ongoing socio-politically evolving conversation, enhancing and empowering the agency of tribal peoples rather than reducing it. Complexity science is offered as a suggestion of a theoretical paradigm that could offer a useful starting point in response to cited work that recommends a “bottom-up” solution in harmony with the tribal system in response to Yemen’s problems.

The nature and content of this paper is situated in the much larger domain of education and international development, which, although not thoroughly presented as a basis from which the paper is derived, it provides an underlying set of guiding principles. For example, a core assumption of this paper is that “development” is a process of positive change over time without a single model or goal, given nuance and character by the “specific political and moral positionings brought to it by its users” (McCowan and Unterhalter, 2015).

Pertinent thematics of education and international development present in this case study of Yemen include: economic growth, inequalities, conflict, and community, among others (McCowan and Unterhalter, 2015). This paper implies such development is needed in Yemen urgently to refocus the outcomes of current ongoing conflicts there, and that this could be achieved through education in a bottom-up style through the tribal system. This rests on a fundamental pairing of relationships observed between education and international development: that “development includes education”, and that “education drives development” (McCowan and Unterhalter, 2015).

The paper therefore first outlines the context of Yemen, its educational situation and needs, followed by a consideration of complexity science, the work of Freire and other implications for practice that could add value to the current social, economic and other needs of Yemen as seen through the perspective of educational intervention at the grassroots level. Finally, a discussion of how complexity science could be meaningfully applied to the case of education in Yemen is presented, along with seven recommendations for the focus of future international aid interventions in Yemen. The scope of this paper does not, however, extend to a comparison of differences between tribal society and administrative society in-depth. The elements of the tribal composition and its features that are mentioned here are those of immediate relevance to the discussion presented. A greater in-depth analysis, presentation and comparison of Yemeni tribal society vs administrative society is the subject matter for another paper requiring a different methodological starting point, and not dealt with here.

Yemen

The Republic of Yemen is found at the south of the Arabian Peninsula in Western Asia/Northern Africa, bordered by Saudi Arabia, Oman and the sea. With a population of more than 27m people, UNESCO (2016) classifies Yemen as one of 50 lower-middle income and one of 13 conflict-affected countries, with an annual growth rate of 2.3 per cent. It is one of 50 nations categorised as a “Least Developing Country” (LDC) by the United Nations (UN) due to low gross national income, so-called “weak human assets”

and a high degree of economic vulnerability, and is thus deemed among the “world’s most impoverished and vulnerable countries” (The Nations Online Project, 2018). It is also a country in the fourth year of a complex civil war between a group called the Houthis on one side, supported by Iran, and a group on the other side led by the President and the ruling elite, supported by Saudi Arabia and the USA – a civil war which has so far been responsible for more than 10,000 deaths (BBC, 2017). Yemen is subject to ongoing counterterrorism campaigns, weak governance and is populated by a mainly tribal society on the brink of famine, which was recently brought to its knees by a cholera epidemic affecting a million people (Dewan and Pettersson, 2017; OCHA, 2018). The British Foreign and Commonwealth Office advise against all travel to the country.

In the midst of ongoing and intense conflict in Yemen, recent reports have attempted to unpick the dynamics of what is often broadly labelled as a terrorist threat, set in the more nuanced context of relationships between Yemeni tribes, Al-Qaeda Arab Peninsula (AQAP) “militants”, Yemeni politics and society (Al-Dawsari, 2018). In addition to recent political turmoil and civil war, Yemen has endured hundreds of US airstrikes as part of the US counterterrorism campaign against Al-Qaeda generally, and AQAP in particular, and, although largely rejecting and pushing back against AQAP’s “radical and violent ideology” – while also sometimes joining forces against the Houthi with them – local tribes have had their authority challenged by AQAP and also seen some of their people join the group – meanwhile the Yemeni ruling elite have been seen to fail in confronting AQAP and, at the same time, also instigate the civil war (Al-Dawsari, 2018). AQAP recruit tribal youth, marginalised without economic prospects, offering status and material gain (Al-Dawsari, 2018). The tribes, being left seemingly to fend for themselves in this complex and chaotic backdrop, have been seen to use “peaceful conflict resolution to deal with AQAP threats, and resort to force only in what they assess as particularly dire circumstances and when they have exhausted all other options” and, as Al-Dawsari (2018) argues, have helped to limit the spread of AQAP, therefore making the tribes a “key to countering the group effectively”.

Instead of continuing airstrikes, a “bottom-up” emergent approach has been recommended as a key solution in resolving conflict in the country, engaging hand in hand with Yemeni tribes (who are recognised as operating within a well-developed system of rules, rights and obligations), in order to not only strengthen security but also improve living conditions and address a wide range of issues, including humanitarian and economic needs (Al-Dawsari, 2018). It is a key argument of this paper that advancement in the educational domain could also be sought at this emergent point of tribal engagement, and that a synthesis of theoretical models offered by the work of Freire and complexity science might provide the foundation from which to lead such an endeavour.

Humanitarian, economic need and education in Yemen

Humanitarian and economic needs of course include education. For those children that make it to school age in the Republic, compulsory education is held to be legally mandated between the ages of 6 and 15, and free education is supposed to be provided for 6 years in primary, and for 3 at secondary level (UNESCO, 2016). Pre-primary in Yemen refers to 3–5 year olds (intended therefore for 2.233m of the

population), primary is meant to cater for 6–11 (4.051m), while lower secondary means 12–14 years, upper secondary is 15–17 (3.662m) and tertiary or higher education is for 18-22 year olds (2.926m of the population) (UNESCO, 2016). The same UNESCO (2016) report shows that although there are 17.1 per cent of pupils over-age for their grade in Yemen, only 63 per cent of pupils between 2009 and 2014 completed their primary education.

In total, 90 per cent of students were recorded as making an effective transition from primary to lower secondary in general education in the school year in 2013, and a total of 1,768,000 students enrolled into secondary education in the school year ending 2014, with only 40 per cent of those being female. Finally though, while 45 per cent of students completed lower secondary, only 30 per cent completed upper secondary education from 2009 to 2014, and participation in technical and vocational education programmes was practically non-existent (UNESCO, 2016).

At each level of education, there are significantly fewer females enrolled than males, and of the recorded 583,000 out-of-school children for the school year ending in 2014, 73 per cent of those were female (UNESCO, 2016). The UNESCO (2016) report showed an 89 per cent youth literacy rate for the age group 15–24 in Yemen, but, in real terms, highlighted the 623,000 illiterate youths from the same age range, 87 per cent of who were female. Adult literacy for the same period (2005–2014) stood at the lower figure of 69 per cent, with 4,849,000 adults being recorded as illiterate: 75 per cent of those being female. While the Yemeni education system does have a nationally representative learning assessment in early grades (2 or 3) of primary education, it does not have one at the end of primary education. In terms of percentage of pupils in these early primary grades achieving a minimum proficiency level, while there were no data available at all for reading scores, only 8 per cent of pupils from 2009 to 2014 obtained the minimum standard in mathematics (UNESCO, 2016). Emphasising the impact of this low level numerical ability on the economy and society, only a very small minority of adults in Yemen have been found to be financially literate:

“A Standard & Poor’s module with numeracy-based questions related to interest, compound interest, inflation and risk diversification was attached to the Gallup World Poll and administered in more than 140 countries in 2014. The survey defined people as financially literate if they correctly answered questions on at least three of these four financial concepts. It found that 33 per cent of adults worldwide were financially literate, from a low of 13% in Yemen to a high of 71% in Norway” (Klapper et al., 2015, in UNESCO, 2016). The Yemeni primary-school-mathematics-to-adult-financial-literacy-pipeline therefore requires immediate attention.

Based on data representing the 2012–2015 period, no standards are seen to be set and enforced in Yemen on the pupil/teacher ratio in public early childhood education institutions (World Bank SABER early childhood development country reports, in UNESCO, 2016), implying class sizes could be high – no data on class sizes are available in this instance. Government expenditure on primary education in Yemen as a percentage of GDP per capita was 19.4 per cent in 2014, while it was 12.6 per cent for secondary education. Of expenditure on primary in education in public institutions, 3.4 per cent was spent on primary textbooks and teaching materials, and 93 per cent was spent on teaching staff salaries – however, while priorities for budgets are on staffing costs, it might not logically follow that this represents sufficient numbers of

teachers employed – again, no data on numbers relating to teacher staffing are available.

A UNAID 2011 report highlighted that “In 32 countries, fewer than half of schools provide life skills-based HIV education” – in Yemen, the figure was less than 5 per cent (UNESCO, 2016). The UNESCO (2016) report had no data for Yemen for adult ICT skills or adult educational attainment, but did point out that only 53 per cent of schools had toilets or sanitation facilities including basic drinking water installed, and that 16.7 per cent of females married between the ages of 15 and 19, and 58 per cent of girls had teen pregnancies. A total of 16,900 students were recorded as being enrolled as internationally mobile students (outbound) in tertiary education in the school year ending 2014, indicating that some Yemeni students did make it to universities abroad. Of those that have made it out of the conflict zone, scholarship programmes might be helping, but could equally perhaps do more. As a means of providing higher education opportunities for “suitably prepared youth and adults from developing countries who would otherwise not be able to afford them” scholarship programmes provide a significant boost (UNESCO, 2016). In Yemen’s case, however, it begs the question as to how “well prepared” all youth and adults could be given the current circumstances and perhaps requires a review of how preparedness for such programmes could be increased. In terms of number of scholarships awarded, Yemen has an outbound mobility ratio of approximately 5 per cent and compares poorly with quite a few other least developed countries, for example, Djibouti and Bhutan, which both had ratios of 40 per cent. Other LDCs also performing better than Yemen in this regard were Mauritania, Malawi, Timor-Leste, Afghanistan, CAR and Nepal (UNESCO, 2016). This suggests that more scholarship programmes and initiatives could be launched to focus on the Republic of Yemen more specifically.

Biases against economic aid-driven models of development notwithstanding, Yemen does receive substantial aid to education: the 2002–2003 annual average was US\$44m, in 2013 US \$89m and in 2014 US\$95m – figures which are still quite low, however, compared with aid received by Afghanistan, India, Pakistan, Tunisia and Turkey, for example (UNESCO, 2016) - it’s always worth noting how much aid ex-commonwealth countries receive compared with others.

In spite of these data and the previously mentioned tremendous difficulties and challenges ongoing politically and conflict-wise in the region, Yemen was among 50 countries selected in a UNESCO review based on those that achieved strong progress in education and literacy during the period between 2000 and 2015, and was identified as “a symbol of global progress and wider literacy efforts” (UNESCO, 2017). The spread of literacy in Western Asia and Northern Africa has been linked with the “demand for political freedom and socio-economic development expressed by young people in these regions”, suggesting its important role in democratisation and stabilisation (UNESCO, 2017). A greater investment of aid in the form of scholarship programmes and preparedness for them would arguably therefore be a worthy investment – one of potentially greater value to re-engage marginalised tribal youth who are too easily conscripted by AQAP, a risk otherwise mitigated by the vicious circle of more airstrikes.

UNESCO (2017) findings have led to the recognition and acknowledgement of “The complexity and variety of literacy and its connection with the whole of life at individual

and societal levels” which has allowed the organisation to encourage “stronger intersectoral collaboration among stakeholders as part of broader educational efforts”. In this way, literacy has come to be understood “as a means of communication conditioned by its socio-political context that will continue to evolve, whereby the sustainable development agenda, lifelong learning and the digital society are important influencing factors” (UNESCO, 2017). These intellectual aims make sense but are seemingly bold and ambitious given the current context on the ground in Yemen. The stakeholders include an array of people representing “traditional” and tribal values, where girls are frequently out of school, marry and give birth young, and have a great chance of being illiterate, in addition to much of the population only completing primary level education. As stated above, three-quarters of adults reporting as illiterate are female. Perhaps it is sadly not surprising therefore that 49 per cent of Yemeni women aged 15–49 say a husband is justified in hitting or beating his wife for at least one of five reasons (e.g. burning the food) (UNESCO, 2016). These gender inequalities are known to compound into women also agreeing that “a university education is more important for boys than girls, and that men have more right to jobs when they are scarce” (Bhatkal, 2014, in UNESCO, 2016), all of which are well-established indicators that have a direct impact on gender equality in and outside education (UNICEF, 2014c; Loaiza and Liang, 2013 – both in UNESCO, 2016).

Adolescent birth rates, or teen pregnancies, are used as an indicator by the Demographic and Health Survey to show how effective education is, as judged against so-called “desirable development outcomes”. In figures illustrated in the UNESCO (2017) report, the trend is that adolescent birth rates are highest in those with no education at all, less high for females with only primary education, lower for girls with secondary education and lower still or non-existent for those with higher education – this holds true for data provided on Yemen, where per 1,000 women, figures from the year 1997 approximated 125 adolescent births for girls with no education at all, just over 100 for girls with primary schooling, slightly more than 50 girls with a secondary education and 0 for women with higher education. These numbers improved by 2013 overall, but there was a slight rise for women attending higher education having given birth. As a whole, these statistics compared favourably with much higher adolescent birth rates found for girls in Madagascar, Cameroon, Peru and Haiti, for instance, but not as well as Pakistan – the only country with lower adolescent birth rates in the group of countries compared. The same UNESCO (2017) report provided reference to a similar set of indicator data, based on under 5 mortality rates, of deaths per 1,000 live births. The data show clearly a lower rate of infant mortality with greater levels of education – in Yemen, these data saw great improvement from 1997 to 2013. So while some statistics are deeply concerning, others offer hope – hope that as in neighbouring Arab countries, the opportunity that advancement in education in general and for women in education, in particular, might be a possibility.

Juxtaposed with the cultural and social challenges of education in Yemen are the essentialist and physical threats of attacks to education, which can come in a variety of forms, and which, in Yemen, have occurred between 500 and 999 times in the period between 2009 and 2012, which UNESCO (2016) lists as including:

- “Any intentional threat or use of force, including those directed at students and educators, at education institutions, including recruitment into armed groups”;

- “On the way to or from an education institution because of someone’s status as a student or educator”;
- “Directed at activists, including teacher union members, as well as education personnel and education aid workers”; and
- “Schools, teachers and students are often directly attacked, whether by state security forces or non-state armed groups, for political, military, ideological or sectarian reasons”

Also of note is the potential military use of schools which takes place in many places around the world. Effects of direct attacks, risks of attacks or a wider general effect of an accompanying climate of fear and instability can paralyse whole education systems, forcing schools to close, discouraging student attendance and teacher recruitment (UNESCO, 2016). Another side effect of conflict and such an unstable environment is displaced individuals or refugees. Although refugees are seen to present a significant challenge for the education system (UNESCO, 2016), available data suggest that refugees in Yemen fare above average in terms of school enrolment rates globally. For example, “Data remain limited for many refugee situations, but the most recent data from the United Nations High Commissioner for Refugees estimate that, worldwide, 50 per cent of primary school-age refugee children are out of school and 75 per cent of adolescent refugees at secondary level are out of school. Refugee children and adolescents are five times more likely to be out of school than their non-refugee peers. However, this average obscures significant differences across countries. Primary enrolment rates among the displaced are 80 per cent in Egypt and Yemen” (UNESCO, 2016). This could suggest that due to the extremely impoverished state of the country, refugees may well be living on a par with other Yemeni people, and therefore not be as severely disadvantaged by comparison – a levelling of social inequality perhaps.

However, if the aforementioned recommendation by Al-Dawsari (2018) to engage more in an emergent bottom-up way with the tribes were acted upon, perhaps the educational agenda could be addressed by this route as well, with literacy at its heart and encompassing a broader range of educational aims. This would start from recognition that the “Demand for literacy is an integral part of pursuing the SDGs, requiring purposeful and ongoing intersectoral collaboration” (UNESCO, 2017).

As stated above, education in this way might be understood “as a means of communication conditioned by its socio-political context that will continue to evolve’, whereby the sustainable development agenda, lifelong learning and the digital society are important influencing factors” (UNESCO, 2017). The need for a useful paradigm therefore arises through which to conceptualise these aims in the context of Yemen. One such paradigm is afforded by complexity science.

Complexity science

Perhaps the most appropriate theoretical lens from which to begin to articulate such a vision of bottom-up emergent educational engagement with tribal peoples is one enhanced by complexity science. Certainly, the “bottom up emergent” direct engagement with key actors, in this case Yemeni tribal people and groups, is encapsulated through the model provided by complex adaptive systems (CAS) theory (Dooley, 1996).

Academics and practitioners in the domain of organisational science have applied principles of complexity science and the CAS to the way both organisations and the people in them interact and operate (Beinhocker, 1998, 2001; Horgan, 1995; Pascale, 2001; Plexus, 1998a, b; Regine, 1998; Wolf et al., 2008; Pasher and Webb, 2008; Webb and Lettice, 2005b, 2003). The CAS theory posits that individuals and factors of influence within and between systems are agents in co-evolving interaction with each other, and that, over time, their interactions lead to a variety of outcomes. Six important elements at play that require acknowledgement as dynamic properties of such emergent systems include: diversity, history and time, the edge of chaos, self-organisation and emergence, unpredictability and pattern recognition. These six principles can be loosely defined thus (Webb et al., 2004, 2006; Webb and Lettice, 2005a):

(1) Self-organisation and emergence: groups of people show self-organising behaviour and can be supported by an enabling environment. Self-organisation means that arising from the interactions between people, some outcomes can seem to emerge without being planned, i.e. that single agents of a system or group seem to develop a structure bottom-up on their own, without having a master-plan or an observational guider telling them how to organise. Implications for application in the Yemen context include:

- The tribal structures based on values and customary law influence the way people respond to news, development and information, as well as their response to education. In this sense, the self-organising and emergent interplay of Yemeni tribal members in accordance with these factors can be the focus for how change and intervention is approached for educational purposes.
- Rather than planning educational intervention with the elite governmental bodies in a top-down way, the locus for planning and implementation should be among the tribal system itself.

(2) Edge of chaos: the edge of chaos is not a physical place, but rather as a mid-point between complete anarchy on the one hand, and rigid control and strong order on the other. It can be interpreted as the balance between structure and flexibility that a group of people needs to become thrive for optimum levels of creative spontaneity – whether than be in social groups or organised networks in society or in or between organisations. In complexity science, the edge of chaos, i.e. the zone between complete stability and complete chaos, is a metaphorical area, where a system could be defined as being the most productive. Implications for application in the Yemen context include:

- Tribal systems based on autonomous interacting families organised in a non-state, non-hierarchical manner should not be deemed to be anarchic.
- Such systems should be acknowledged for the dynamic possibilities afforded by more flexible structuring and potentially more responsive to initiating change in fluid ways in line with their own values and as an extension of these.
- Such systems of people should be approached as creative entities who can respond to issues in spontaneous ways.
- Linking through to the work of Freire (1970), this would lay the basis for a stepping stone to “critical consciousness”, often perceived by some as “anarchic” or with the potential to “lead to disorder”, but, in this case, a vital component of an approach which would embrace and utilise the creative potential of the Yemeni tribal system. Freire here advocates not confusing

“freedom with the maintenance of the status quo” (Freire, 1970) – the potential of the “edge of chaos” as a “sweet pot of change and innovation” would maximise the potential of change within a fluid system, more than could possibly be achieved where the desired result was to maintain the status quo.

(3) Diversity: in economic terms, networks and groups of people or organisations need to understand and leverage the diverse set of agents or people among them to be successful and to enable effective and desirable structures to emerge. For example, in companies where innovation is required as part of sustainable business development, this can mean that the right mix of people is indispensable for innovation and creativity. Self-organising teams are believed to be able to thrive and flourish if team member strengths and weaknesses are maximised; it is the combination of different abilities that makes such a system creative, but also robust. Implications for application in the Yemen context include:

- Problems arising from social inequalities in Yemen need to be viewed through the flattening lens of diversity. The diversity in Yemen, for example, includes: tribal entities, state organised governmental systems, gender inequalities, marginalised youth being radicalised for AQAP and refugees.
- This diversity needs to be represented at the decision-making table in a mode that would leverage co-evolutionary responses to problem solving and education.

(4) History and time: all groups of people and networks have a sense of historicity. This means that, although the future behaviour of a group of people cannot be extrapolated from the past or predicted, the past of this system is still important for its present and future position – sensitivity to initial conditions is another related concept of strong relevance. Implications for application in the Yemen context include:

- The issues that have led to marginalisation of certain groups and individuals that have evolved into AQAP need to be brought to bear in co-creating future paths that respond to such underlying factors.
- Individual memories of painful experiences from, for example, conflict and gender based inequalities, need to be handled sensitively, and possibly through psycho-dynamic therapeutic methods.
- Healing from such pain will take a lot of time.
- Appreciative inquiry focussed on what good has been done needs also to be exercised and built upon so as to provide a strong foundation for future action.
- Linking again to the work of Freire (1970), his concept of “conscientizacao”, i.e. “learning to perceive social, political, and economic contradictions” and taking “action against oppressive elements of reality”, his approach would advocate “making it possible for people to enter the historical process as responsible subjects”, enrolling individuals in the “search for self-affirmation”.

(5) Unpredictability: the notion of unpredictability implies that the development of a group, society or network cannot be foreseen, i.e. not extrapolated from past behaviour (see above) and not calculated on the basis of linear cause–effect relationships – although a strategic plan may set out clear objectives based on the stakeholders identified in the plan, many unforeseen eventualities may arise, leaving to the need for a response to the emergent, and the potential to embrace unplanned opportunities should they arise. Implications for application in the Yemen context include:

- Recognition needs to be given to the external contributors to the ongoing conflict in Yemen and the amount of power they hold over the stability or instability of the region of Yemen.
- These external players, such as Iran's influence and support of the Houthis, or British commercial supply of weaponry that is used in the Yemen conflict, or American airstrikes, will continue to pose a threat to the stability in the region unless they are also engaged at the table of decision-making diversity.
- Countless other potential actors and factors contributing to unpredictable occurrences cannot be foreseen; hence, their unpredictability, for example, the risk of further outbreaks of cholera, or other humanitarian crises, or other international military threats hitherto unanticipated.
- A flattened-hierarchical framework or model for emergent response to rapid and unpredicted change needs to be co-created within Yemen at all levels of tribal society and other state actors therefore, due to its dynamic and fluid social state.

(6) Pattern recognition: behaviour between people and groups shows patterns over time. In the natural sciences, these patterns can, for example, be observed in a flock of birds or the complex structures of bee hives. In the context of human behaviour, this can be made evident by friendships, family ties and groupings of like-minded people or those with the same interests, in the emergence of social entrepreneurship, small-to medium-sized enterprises or simply the emergence of solutions to problems through innovation. Implications for application in the Yemen context include:

- Naturally occurring relationships such as recognised through the Yemeni tribal system grounded in customary law and values need to be acknowledged as the locus of interaction and negotiation from which to attempt to co-create and co-evolve educational futures - not from the outside-in, but at grassroots level.
- The elite governing class that many in the country report feeling abandoned by are not the appropriate system in Yemen that should be used from which to organise and administer meaningful change.
- The elite governing class might well consider a change in perception of their own role in future that acts as an enabler for bottom-up structures to emerge through the tribal system, and perhaps to initiate a step change that allows their administrating and organising bodies to facilitate this through participative dialogue.

By way of summary and in extension of the above, it becomes possible to say therefore that different constellations of system diversity and the affordance of network interactions between diverse agents within the system lead to different patterns and possible outcomes that are often historically dependent, and will unravel in unpredictable ways over the continuance of time.

Agent interactions might well be planned, but their interactions also lead to side-effects and to self-organising emergent patterns in behaviour and outcomes over time. In this sense, and if this theoretical view is adopted, it is essential to facilitate and enable key agents within systems to interact as optimally as possible with other agents in order to maximise potential outcomes between them, in harmony with key objectives. In this way, diversity needs not to be managed, but to be navigated and leveraged, across all levels of society, by individually empowered actors (Webb, 2008b).

While applied to human systems this also requires power differentials to be recognised and acknowledged: humans with power and influence often interact with other powerful and influential humans and sometimes therefore the less powerful and influential can be marginalised in society. If a theoretical starting point to system and process design takes this into account, however, it is possible to ensure that power and influence become more freely distributed within a system. Ensuring this is focussed on desirable outcomes for Yemen, such as education, sexual equality and poverty eradication, for example, rather than undesirable outcomes such as marginalisation, crime, terrorism, conflict, famine and cholera is essential.

For human systems, the CAS theory goes so far (Webb et al., 2007). It would emphasise the importance of networks, and, in Yemen's case for a humanitarian and economic system design, would put the focus on trying to establish bottom-up emergent potential of, for example, tribal parties, in projects including those with knowledge, skills and experience in the sustainable development agenda, lifelong learning and the digital society in order to allow these to be able to flourish. The agency of those within the system, including tribal leaders and members, would shape the communication defining the socio-political context that would continue to evolve in a hybrid and fluid way.

In this context, participative dialogue and communication would be theoretically seen as manifestation of conversations between the diverse agents in the Yemeni system – a view held by Stacey's theory of complex responsive processes of relating (Stacey et al., 2000; Stacey, 2000, 2001, 2003a, b, c). Stacey's view also postulates the perspective that there is no system boundary and that all interactions over time are just conversations between diverse people, whose diversity is defined by a range of characteristics, including power and influence, and the outcomes of interactions between such diverse people are influenced by who talks to who, or who does not talk to who, in addition to knowledge, skills, motives, intentions and a wide array of psychodynamic factors besides. Stacey further argues that the principles of complexity science mentioned above can also help to inform the very haphazard way outcomes are often reached, beleaguered by misunderstanding and unintentional occurrence, and frequently far from the well planned intentional strategies scoped out in advance of a project. Implications for application in the context of Yemen include:

- (1) emphasis would be required again on the representation of diversity around the Yemeni decision-making table;
- (2) co-creation and co-evolution of creative responses to problems and key issues would be facilitated through continual conversation and negotiation through a flattened hierarchy of diverse Yemeni representatives; and
- (3) communication and influence would need to be opened up over time in a processual manner to include those who currently feel excluded due to social inequalities – e.g. through gender or social marginalisation and poverty.

Social network theory, social network analysis, and stakeholder mapping all become key in the nature of the system design being advocated here, which essentially might also be thought of as a form of social engineering to leverage potential within certain groups to eradicate social marginalisation, social inequalities and the negative side-effects and impacts of these on humanitarian and economic interest (Webb, 2008a).

Where social capital within and between certain groups is already strong, then there is a strong foundation for building relationships and connections between other groups, and also for allowing the digital free flow of communication between them to enable education and free enterprise to flourish. Where social network analysis reveals missing links between certain people or groups, then it is a matter for strategic humanitarian and economic development to seek to fill these gaps in order to make social capital within a system stronger (ibid). Social capital is largely built and improved through trust between people.

As a matter for education, Freire's (1970) work on the "Pedagogy of Oppressed" may also be of value here. In seeking to go to people to transfer knowledge and improve literacy as a key aim of education, Freire advocated for a largely non-hierarchical mode of doing so, where the teacher figure was also a learner, learning from his or her students at the same time, often termed as the promotion of the "liberation of the working classes through a cooperative teacher-student educative model", where the "essence of education" is seen as the "practice of freedom" (Freire, 1970). In this way, education is a knowledge exchange which acknowledges and gives agency to those being "taught", or, in Freire's words, not a "gift" or a "self-achievement", but "a mutual process" where the people engaged in the process of learning are "conscious of their incompleteness, and their attempt to be more fully human" (ibid). Freire's approach seeks to acknowledge yet overcome "conquest, divide and rule, manipulation, and cultural invasion" through "cooperation, unity, organisation, and cultural synthesis" (ibid). His position reinforces a vision whereby "men and women" are perceived to "fight side by side and learn together how to build" their future – "not something given to be received by people", but rather "something to be created by them" (ibid). Freire gives the people the "humanistic and historical task" of the "oppressed" – "to liberate themselves and their oppressors as well" (ibid). This would arguably further strengthen any approach in a fragmented society such as Yemen where the governing elite exist in an entirely separate world and mode of being than the tribal systems the majority of the population is comprised of.

As a critical pedagogic perspective that emphasises the potential of every individual, Freire gives an idea of what kind of processes could empower those who are disempowered – often through social inequalities (Berglund and Johansson, 2007). Educational strategists and international development agencies are in a unique position to bring to reality this notion of empowerment and to distil this as expected practice as part of a general approach. One process advocated by Freire's critical pedagogical perspective is "conscientization", a type of learning that is focussed on perceiving and exposing contradictions as a foundation from which to take action (Berglund and Johansson, 2007) – perhaps, in Yemen's case, this could be a way to start engaging with tribal peoples in participative dialogue: converse with them about the contradictions between how things are and how they might be in order to create a foundation from which to act together.

Complexity science is clearly and obviously strongly related to Freire's (1970) work here. Complexity science through the CAS theory and complex processes of relating theory, as articulated above, put the emphasis on diversity and flattened hierarchies. This is resonant with Freire's own emphasis on the flattening of the hierarchy between teacher and student, and the idea that the teacher also could learn from the student in a mutually co-evolving process of learning – thus diminishing the power relationship

between the two. This fulcrum would also be key to structuring a framework for educational intervention co-creation with, within and between the tribal systems. The “power” would have to be relinquished by the so-called governing elite class in order to enable a truly rich and flourishing bottom-up response to emerge from within the tribal system of Yemen.

The “conscientization” approach would also include some difficult conversations between tribal players in order to focus on gender inequalities – i.e. the tribal value and customary law which seeks to protect women and girls at once is in contradiction with a set of norms that sees 75 per cent of the population excluded from academic achievement based on gender. These difficult conversations would be ongoing over time, and grounded in history of what is deemed as acceptable abuses and violence against women. It is likely that such contradictions would lead to further conflict and unpredictable outcomes. At the same time, the risk comes with high reward, as articulated by Freire, that “the pedagogy of the oppressed is an instrument for their critical discovery that both they and their oppressors are manifestations of dehumanisation” and that this creates the opportunity for transformation, and the reclaiming of their humanity. The positive spin Freire gives to this is that recognition of oppression is not a “closed world from which there is no exit” but instead just “a limiting situation which they can transform” (Freire, 1970).

What this can transform towards is still an unknown, but in the midst of the current global trend towards ever greater technological advancement and an increasingly global digital society, the spread and use of digital technology and tools should also be factored into future humanitarian and economic goals that encompass education and literacy as part of their strategy as part of the goal to ameliorate social inequalities. However, as stated in previous sections above, there is no data available on ICT literacy rates in Yemen currently, which would need assessing and addressing to switch Yemen on to the Fourth Industrial Revolution and the utopian dream it offers. Indeed, it is the vision of the chief proponent of the Fourth Industrial Revolution (Schwab, 2017) that everyone in all societies can be part of the technologically enhanced future promised, but that, in the meantime, the fourth industrial revolution must be shaped in order to achieve that.

Certainly, those in positions of power and influence can help in this shaping process, in order to ensure that social inequalities do not prevent all people from engaging, and that by through such a process, threats from socially marginalised groups of people can be reduced and therefore allow more attention to be paid on improving humanitarian, economic and educational goals. A consideration of how the above thinking can be utilised to good effect in the context of Yemen follows in the next section.

Application of complexity science to the Yemeni situation

In harmony with the preceding discussion, arguably, addressing a system design for education in Yemen requires a large increase in efforts made towards developing the communication channels with tribal peoples, seeking to demarginalise those within them economically and in humanitarian ways through education, literacy and digital integration. While economic and humanitarian objectives can in principal be achieved in part through education, this should not be limited to literacy, numeracy or financial

literacy – the affordances also offered through digital integration would exponentialise the potential for innovation and social entrepreneurship as well (Dvir et al., 2006, 2007; Webb, 2018a, b). While high income countries are leading the way in integrating innovation in educational cultures, or through use and implementation of innovation labs (Schwab, 2017), it would be remiss not to lay the basis for such an approach and use of technology to be made available in low to middle income countries such as Yemen.

In seeking to synthesise the complexity science inspired approach articulated above, it is worthwhile reflecting on how Yemeni tribes function. While this paper does not provide an in-depth analysis of the values and functions of Yemeni tribes and customary law, the key issue presented as follows at once leads to recognition of why a bottom-up emergent approach is required:

- Tribes are egalitarian, not hierarchical, institutions, and as such do not have a tight command-and-control structure.
- Tribal leaders, or sheikhs, do not have unconditional authority over their tribes or their members.
- A sheikh's legitimacy and authority depend on his ability to provide for his constituents [...] tribal self-definition rests on the dual principles of respect for individual autonomy and of community responsibility. (Al-Dawsari, 2018)

This lack of hierarchy and absence of command-control culture coupled with the interaction of highly autonomous individuals lends itself immediately to systems-based approaches underpinned by the assumption of highly distributed organisational processes as made apparent by complexity science principles. Tribal values, which extend to urban areas in Yemen, are based on “customary law” and “preservation of honour” (Al-Dawsari, 2018), which includes “hospitality, nobility, generosity, commitment to one's word and protection of the ‘weak’ (women, children and subordinate allies)”. Infringements of this customary law can include harming public interest, which also includes destroying schools, which is equated with highest order offences such as murdering innocent people and killing soldiers (Al-Dawsari, 2018). It is therefore evident that schools are, and by extension education is, highly valued. This set of values can be used from which to present individuals with informed choices concerning education: if women and children are to be protected, could it not be argued that education and literacy is one way of strengthening such protection? Could it not be argued that it would be in the interest of the community to educate women and children with equal priority to males? Should therefore not all females remain in education until completion of higher education? If nobility, hospitality and generosity are valued, could it not be argued that greater economic prosperity obtained through greater application of egalitarian principles in the public interest should be given more effort in order to enhance one's nobility, and to be able to offer greater hospitality and generosity to others? Could it not be the case that more egalitarian engagement with education, literacy and the digital society would enable this to occur more rapidly?

Al-Dawsari (2018) reinforces this idea that “the collective interest of the tribe or community is prioritised over the individual”, and that this “concept of collective responsibility is a foundation of the tribal law”. Negotiating between the individual and the community then would be key, where individual acts can be seen to have consequences for the whole tribe, and where tribes are ultimately held responsible

and accountable for member actions. If the values of customary law could be discussed to marry more closely with the aims and potential beneficial impacts of education so that it was seen as part of the collective interest of Yemeni tribes to have all their children attend all levels of education and to more actively discourage teen pregnancy, for example, that might go some way towards alleviating other economic and humanitarian problems that are systemically connected with these fundamental issues. If it was seen more convincingly to be part of the collective tribal interest that no child was out of school, and that all children should complete secondary education and engage in some form of tertiary education, it would no doubt increase even further current literacy rates and provide an alternate future for many Yemenis, a future that could be defined by individual agency as part of the digital society.

If international “aid” projects were therefore brought into line with approaches that could navigate these relationships and values, it might well be possible to create the foundation from which to channel funding into more rigorous mechanisms helping a greater number of Yemenis stay in education until tertiary level, including equal numbers of females, and for this education to be channelled into supporting social entrepreneurship and innovation development opportunities, encouraging more powerful engagement as part of a digital society.

Conclusion

The challenges presented in Yemen that create seemingly intractable problems mean that it would be naïve and culturally imperialistic to assume that any answers or responses would be easily articulated without some hubris. However, this chief limitation notwithstanding, there is a humanitarian imperative requiring all efforts be made to address the social inequalities that are systemically connected across the globe. Yemen is indeed part of our connected human family and the global ecosystem. This paper merely sets out a review of the current situation and the potential complexity science offers to perhaps ameliorate this and also provide direction for future aid and international development.

Revisiting key issues already presented in this paper are perhaps worthwhile in conclusion. The humanitarian argument and imperative exists that requires an alternative to airstrikes and conflict resulting in the loss of thousands of human lives. This topic demands attention at the highest global levels, but is seemingly one that few politicians are willing to speak out over, and requires an alternative approach couched in terms of social and humanitarian justice; such an alternative approach could be found through a combination of responses to social, economic and other needs at the grassroots level.

The UN classification of Yemen as an LDC due to low gross national income, “weak human assets”, and high economic vulnerability and impoverishment does not accord the country dignity. And yet, the economic matter seems of relevance as youth affiliation to AQAP seems to be blamed on economic and educational marginalisation. In the meantime, perhaps the economic distress the country seems to be labelled with might not be so profound if certain global actors were to halt conflict. The problem might not be that “Yemen is poor”, but that instead other countries are hammering Yemen beyond reason and need to stop. If the argument is that AQAP poses a threat, then seek out ways to stop membership recruitment: it is a key argument of this paper

that education is a key way to address this, offering a range of possible alternative outcomes. If Iran is backing Houthi rebels and stirring up contention, then a range of other conversations might be had. The perceived vulnerability of Yemen and its “weak human assets” can also be re-framed to accord dignity and power to the strength of Yemen’s tribal system.

The role of adult and female literacy, female engagement in education, primary mathematics achievement levels and adult financial literacy might also all be reframed. While pointing out weaknesses in these respects, we might be blinded to the strong social capital that exists within the tribal system instead, which could in turn, as suggested, be used as the fulcrum from which to confront and turn around any problems which identify local need. Although contrasted with gender inequalities and abuses, it has to be acknowledged that the female role within Yemeni society is a fundamentally important one – perhaps therein lies a solution. We might dare to dream about who the future empowered educators of Yemen will be. Will they arise from within the strong social capital of a Yemeni tribe? Home educated as lifelong learners perhaps by some of the 89 per cent literate members of Yemeni society or connecting into the digital society?

Will displaced persons in Yemen be given the same chances as Syrian refugees in Jordan? Finding opportunities in innovation incubators to develop their own thriving businesses?

Issues of basic sanitation are important, and could well be linked to cholera risk, but these matters might also be addressed if conflict stopped – something which is being induced from the global level, not from within the country.

The six principles of complexity science identified (diversity, history and time, the edge of chaos, self-organisation and emergence, unpredictability and pattern recognition) provide a useful starting point from which to reframe current perspectives on Yemen, allowing us to see the autonomously interacting families of the tribal system as a strong asset to the country and creative entities capable of shaping change and innovation. The flattening lens of diversity would facilitate recognition and engagement of Yemeni representation around tables of participative dialogue, enabling in turn the Yemeni people to enter their own historical process as responsible subjects with consciousness, to self-affirm, as Freire would argue, giving agency as a practice of freedom in empowering mutual processes. From this, it may be possible for locally defined educational interventions to be co-created, and to potentially overcome the risks of the fourth Industrial Revolution.

For further research, therefore, it would be valuable for Yemeni narrative accounts to be heard, as voices exploring, describing and explaining their own visions for the future: how do they imagine using new technology? How is this already emerging bottom-up? What do they define as their problems and potential solutions? What role might home education play in confronting apparent deficits in literacy among adults and female members of the population? Should teenage mothers be dissuaded or technologically empowered to thrive?

In line with the above, and by way of a summary of key topics covered in this paper, it is appropriate to make some recommendations for intervention and practice.

Recommendations

As part of a final set of recommendations in this paper, and drawing together the discussion so far, the following is suggested:

- (1) call for a review of international aid and development funding being channelled into Yemen;
- (2) utilise a complexity science approach to understand and design interventions in a bottom-up emergent manner around locally defined need;
- (3) put the focus of these efforts on engagement with tribal peoples: where tribes are seen as collective entities comprised of egalitarian and autonomous individual members;
- (4) co-develop educational development strategies grounded in tribal values relating to customary law to maximise potential impact;
- (5) engage tribal Yemeni champions of campaigns such as “all children should be in school and finish school”, and to lead projects for improved sanitation at places of education;
- (6) call for a review and improvement of international scholarship programmes offered to Yemeni people, as well as preparedness schemes to encourage the chances of potential applicants being successful; and
- (7) call for a review of the ways and the means to integrate more Yemenis in the wider digital society and seek to engage meaningfully with them in participative dialogue and in social entrepreneurship and innovation to enhance economic development opportunities.

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