

THE ROLE OF ENGINEERS IN ECONOMIC DEVELOPMENT AND POLICY FORMULATION (A WANDERING HABITUÉ / A THRUST IN BAFFLE)

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1. ABSTRACT

In so many areas / spheres and organizations around the world, engineers have been seen rising to the top level of management and leadership, either purely in technical or partly non-technical roles. This often happens in spite of a glaring absence of formal training in the theory and practice of management and leadership, both in the earlier careers of engineers, or at their later stages. Their infrequent lack of understanding of dynamics of development, or few or more deficits in the required attributes for a role in devising policies, resultantly becomes understandable. This is being faced over and over again despite the fact that engineers have got so crucial a part to play in our overall social or national progress. The organizations, societies, and nations, which have been able to acknowledge and have subsequently been able to develop such a role by engineers, have duly witnessed the buoyant improvements in their systems, which eventually emerged a result of such a recognition over a due course of the time.

Based on the premise as noted above, this paper addresses the importance of role of engineers in economic development and policy formulation, and also for them to be more progressive in their careers while also undertaking the role of being effective managers and leaders. The discussion would also encompass the importance of such a role of engineers in development needs, imbibed as well as requisite, while fulfilling the true requirements managerial and leadership roles in all the allied dimensions, which broadly range from science, accountancy and law at one end and economic development, negotiations and finance on the other.

2. KEYWORDS

Development; Public Policy; Role of Engineers; Leadership.

3. INTRODUCTION

Number of engineers rise to the managerial levels in the industry or public/civil service or in other spheres of their profession. This happens in spite of usual lack of their adequate trainings in somewhat non-technical techniques, such as management, law, HR, business and finance, or leadership, etc., during course of their engineering careers. Though their skills and expertise, such as objectivity or a problem-solving ability, equip them well for management roles, but in their instinct they usually fail to appreciate these necessary aspects of professional, and subsequently the over social and economic development. Many engineers take responsibility of the work of others, may be within the short time after they have graduated from their respective institutions, and thus becoming the managers whether they realize it or not. The formal training in the responsibilities, duties and practice of management is hence needed early in the engineers' careers. But quite unfortunately, this often fails to happen because of a belief among many that the real "hard" work is technical work (e.g. design, operation or maintenance) and that the non-technical or a "soft", work (e.g. HR-related activities, accounts or management) is not that much important. An experienced professional or a senior manager would, however, know it well that this is not actually true.

Several major studies in leadership and management have indicated that the companies or the organizations which have superior techniques for HR practices and have formal training programs for

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leadership and management, have been able to exhibit a distinctive success in their respective domains. This, hence, has supported well the postulate that for an eventual financial success of any business or a company or an organization, the management and policy roles, virtually by all the levels of their hierarchy, stand among the most important issues for the companies/organizations planning to thrive well in the asking environment of today.

Here it would also be worthwhile to jot the classic but simple interpretation of difference among managers and leaders. In plain words, it is said that managers are the people “who do the things right”. The leaders in contrast are the people “who do the right thing”. This particularly becomes important to be understood when we see that a number of engineers reach to the positions where both of these major aspects stand duly recognized as the ascertaining factors, directly or indirectly, in the actual success of any form of social or economic development. By and large, this has come forth with a noticeable sound when it has been seen that so many of the senior managers and chief executives have qualifications in engineering, but unless their backgrounds are publicly disclosed, this may not become apparent to the world. The former U.S. president Jimmy Carter is one of such examples.

Here an argument could have been raised that such managers/leaders doing “non-technical” work are no longer engineers as the engineers should only do the technical works, viz. design, construction, project management, operation, maintenance, etc. The engineering profession, however, does not recognize this squeezed definition and argue instead that an engineer bringing his/her analytical and numerical skills and problem-solving ability to bear on non-technical problems is still entitled to be seen as an engineer as engineers routinely think strategically, negotiate contracts, and recruit and supervise staff and contractors, none of which is truly a technical work.

4. THE CRUX OF ENGINEERING – TODAY AND EVER

Engineering is not science. As Karl Marx said in certain other context - the point is not to understand the world, but to change it. Engineering is thus expected to apply a scientific knowledge, to give itself scientific respect.

We may hence say that engineering is the application of technology to solve problems. But as has nicely and softly been said, if technology is used piecemeal, it may not work. Cars which have aerodynamically been designed to be stable at 120 mph drive through the New York City at around 6 mph. The vehicles at the turn of the century, which were simply horse-drawn, use to commute at an average speed of 11 mph.

Among many definitions, the concept of engineering has also been interpreted as the ‘hard’ way of doing things for solving the problems, as opposed to the ‘softer’ ways, where even the existence of the problem(s) causes more trouble than the solution.

Engineers are taken as designers too - the designers of many things in society. A designer is the one who designs, or one who has designs. For instance, we say that the God designed the world and the Devil has designs on the world.

In many fields of design, part of the traditional skill of an engineer or a designer is the ability to imagine and ultimately conceive the end-product. But quite unfortunately now, this conceptualization skill is becoming redundant as the computers have started to often simulate the end-products.

Let’s also acknowledge that a product gets an added or an enhanced value by the name of the designer. On a lighter side, for example, we say that a popular brand of bottled water is a ‘designer’s water’, a two-day beard is known as a ‘designer’s stubble’, and some new policy of a political party could be termed as ‘designer’s politics’.

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It is hence obvious to be understood that when one is faced with an act of engineering or a design, he does not have a time to think about it from scratch. He is faced with the need to act and he is supposed to act fast; and the only way of acting fast is to rely on the rules of thumb which one has accumulated during the course of his career. In other words, such would be time when substitution of experience is to be made.

The organizing principles learnt over the period of a time, or the collected rules of thumb, together with 'enabling prejudices' as termed by Rowe, which are often being referred or quoted in many references/courses of the management, may partially be ignited here for help.

Hence, engineering alone (or working in solitude) cannot be much of a regime today; except for very specific or well-ascertained spheres of specializations, which are adopted not only by intention, but by purpose as well. The instance to this effect could be quoted as that of the work undertaken by Lacey and / or Kennedy in the field of irrigation engineering.

To continue little more, virtually with the words of Richard Veryard, it would be interesting to add here somewhat extra to the above mentioned glimpse of what is engineering today. This is going to be the comparison of the status of engineers in different countries or cultures around the globe, and the attitude or the perception of the people towards them.

In Japan to begin with, engineers possess very high status. Many businesses in Japan are driven by engineers.

In the UK, where businesses are usually run by financial people, bankers and accountants, the engineers are taken as those having a second-rate education, and as those who can safely be restricted to the technical matters only. Although it has long been reorganized into comprehensive schools, people still think of secondary education as divided into an elitist 'grammar' stream - whose pupils go on to university and then to the careers in banks and the civil service - and an inferior 'technical' stream - whose pupils go on to read sandwich courses at polytechnics. Even the scientists with university education are sometime denied access to the top jobs. An example of Margaret Thatcher, who was a research chemist, would be appropriate here to be quoted. She was trained as a lawyer before she could effectively be entered into politics.

Meanwhile though, the US maintains a curiously ambivalent attitude towards engineers, respecting them inordinately if they become rich, but ignoring them otherwise.

5. BASIC PASTULATES OF CURRENT ECONOMIC REGIME

It would also be befitting to mention at this point of discussion, on the role of engineers in social and economic development, a policy statement from ASCE, which one can find as pretty comprehensive and encompassing :

Engineers have a leading role in planning, designing, building and ensuring a sustainable future. Engineers provide the bridge between science and society. In this role, engineers must actively promote and participate in multidisciplinary teams with other professionals, such as ecologists, economists, and sociologists, and work with the communities served and affected to effectively address the issues and challenges of sustainable development.

ASCE Policy Statement 418

First Approved in 1993

Not much would be required to understand from above that the world today is the world of sustained economic development. But side by side, in the world today, there is a great reliance on technology as well to solve the sustainability problems that are currently being faced or which are likely to be encountered in the nearer or the farther times to come. It is also to be understood that the scale and types of technological changes that would be necessary to keep up or counteract with the growing disorder, caused by increases in population and demand, may not only fairly be dramatic but would need indeed to be adequately understood and addressed. While formulating policies to this effect, now who else would be in a position to assess that which of the earlier technological forms or procedures will not be workable?

Technology cannot be independent of society, either in shaping it or in respect of the consequences. It is quite correct to say that in data of human experience, our tools need to interact with every component of our existence: physical, environmental, educational, psychological, managerial, socio-economical, political and even spiritual, so as to remain to be fully relevant to the human needs. Sustainable economic development, therefore, is the challenge of meeting human needs for products, energy, transportation, effective waste management, etc., while conserving and protecting the society for future development by fully harnessing procedures for the purpose - to the least - of the minimum desired level of economic coexistence or the social transformation where needed. The question which crop up here once again is the same, i.e. who else would be in a position to address?

Engineers, therefore, must be bent to lead this new premise of economic revolution. Fortunately now, there exists is some good leadership by several professional organizations, such as World Federation of Engineering Organizations (WFED), American Society of Civil Engineers (ASCE), and others, to make the economic development a high priority foe engineers to understand. They are in the process to develop and promote the relevant codes of practice and policy changes that will encourage the engineering profession to lead this economic revolution.

Working for sustainability thus essentially requires a shift towards such a perspective which should be capable to encompass the interdependence of individual, social, economic and political activities. The engineers of the future should hence be more and more interdisciplinary. They should be ready even to join with biologists and chemists, not to say with the meteorologist, economists, ethicists and politicians, in unprecedented ways indeed, so as to lead the society on a sustainable economic path.

Moreover, all engineers must also be ready to play a much stronger role in formulation of public policies in order to provide the right incentives for the respective industries, institutions, organizations and others so that they could be encouraged or supported to design sustainable technologies for the purpose of true economic development could be there to effectively serve the society. Don Roberts too, puts up an emphasis that we should be well informed of the interdependence of environmental, economic, health and social issues, informing others and becoming leaders. Otherwise the agenda will be set by those who neither know the benefits nor the limit of technology for a modern society.

6. PUBLIC POLICY VIS-À-VIS DEVELOPMENT

It is obvious to be accepted and expected that there is a strong need for the people to monitor and subsequently prevent the government public policies from attaining a non-developmental texture. It is important both for the economic and welfare states and would eventually lead to the learning for both as they constantly rebalance their policy forms.

Morris's framework of a policy system would tell that by taking social policies as guiding principles for public action, several elements or dimensions could be distinguished, which may affect their evolution and implementation. These broadly include:

- i. the existing social norms;
- ii. aspirations or the goals of a society;

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- iii. understanding of the priorities and preferences;
- iv. sectoral public policy (e.g., housing, health, etc.);
- v. advocated vs. adopted policies;
- vi. the leadership role by the governmental units in moving beyond; and
- vii. criteria for assessing policy guidelines.

There could be some problems here vis-à-vis the completeness of the broader outline of the Morris framework, but the concept which has been articulated by Morris for a “general public policy” as a guide to the priority aims and preferred means of the policy system certainly carry lot of interest. A review of the literature indicates that, while issues on other dimensions or elements have been extensively studied, this aspect of the policy system has received a little, if any, attention from policy researchers, although this is so important an inquiry that if it is kept in the hind, it may simply cause lot of confusion in any cross-national structure. Chen Sheying emphasizes that in practice, the world must pay most serious attention to this if it is to avoid repeating the numerous tragedies caused by state policies throughout human history.

Chen Sheying then draws two basic conclusions from the non-developmental and developmental tinge of public policies. In the first he says that while evaluating and predicting a policy system, we will not arrive at a germane understanding and sensible conclusion unless and until we have analyzed its general public policy. After embarking on the reform path, the state probably faces no less criticism than before for failing to eliminate, and perhaps even for generating more, social issues, including increasing inequality, stagnating political progress, and diminishing social protection of its citizens. However, several developmental economic states have impressed the world with a stunning and continued high growth rates. After two decades of almost exclusive focus on the economy, they have been able to put themselves in a position to be able to address those social issues more actively.

In the second point, quite remarkably one would say, Chen Sheying concludes that the technological workforce and the future managers should get themselves educated about the importance of the general public policy of their state so that they may closely monitor and influence policy at that high level with a keen awareness and thus prevent it from falling into non-developmental paths. This can be done in multiple ways - by including structural alterations in the government, by changes in state spending priorities, and through ideological shifts in leading the public. The point is that no matter how important a general public policy is to the politicians, it is the people that have the highest stake in it. As the people have the right to development, they have the right to be concerned about the general public policy of their state and of other states in the world, for these will no doubt affect their lives in a global environment.

7. PRIMARY NODS OF PUBLIC POLICY

After whole of the discussion of development vis-à-vis the desired role of engineers in public policy under the particular context of economic development, now let’s try to see how the primary nodes of public policy could be narrated. This could rather be interpreted in the shortest as:

...pattern of government decisions and actions intended to address a perceived public problem...

Now as we near to the end of our short but specific discussion on public policy vis-à-vis the requisite role of engineers, we would say that the last thing, which remains to be seen before the phase of implementation is the feel of being “good” about a public policy. Beside several other dimensions, this should also be seen to hold visibly both in general as well as in particular relationship with the engineering aspects of proposed, conceived or the planned outlook of social development.

MIT's description of the principal guidelines to this effect, under the module of "Urban Studies and Planning - Fundamentals of Public Policy", is as below:

Government decisions and actions addressing public problems consistent with widely shared values & ideas, and

Public Policy as Rational Problem Solving

Now it is very important to see here that in the module it is then said to be purely an objective situation which actually determines the goodness of a policy, i.e.:

Neither decision-makers' personalities nor the institutional context of the decision matter;

The technical understanding of the problem triumphs;

An equal understanding of the technical merits always produces the same results;

Government actions to faithfully follow the decisions; and

Priorities to be determined by scale and scope of the needs of society.

One of the simple and effective tool to practice these basic nods have been developed by Dennis Meadows and John Sterman of MIT by the name of Fishbanks Simulation, aimed at effective negotiations, management and implementation skills development. Fishbanks, as defined by the developers, is a multiplayer web-based simulation in which participants plays the role of fishers and seeks to maximize their net worth as they compete against other players and deal with variations in fish stocks and their catch. Participants buy, sell, and build ships; decide where to fish; and negotiate with one another. Policy options available to instructors include auctions of new boats, permits, and quotas. Its learning objective is to provide the opportunity to learn about the challenges of managing sustainably in a common setting, with realistic resource dynamics. It has been recommended or suggested to be taught in the several major cases of developmental and management studies covering from economics, strategy, negotiations and sustainability to environmental studies, public policy, resource economics; leadership and team-building; and in any course in which the dynamics of cooperation and competition, resource management and negotiations are the subjects of interest.

8. ENGINEER'S ROLE - A WANDERING HABITUÉ / A THRUST IN BAFFLE

We would now like to come to the finale of our discussion on the role of engineers in economic development and policy formulation.

Development around the globe, in one way or the other, is an on-going process. It may, therefore, be found as somewhat acceptable to all that this is becoming possible only through the role of engineers in several sets of formats, but at the same time, may be only as that of a wandering habitué - i.e. with an in and an out attitude – and with such thrusts which baffle so often in majority of the instances. To this effect let's also take an example of one of the available samples of a study in the U.S., as has been quoted by Dr. C. M. Chang:

In his book titled "Engineering Management: Challenges in the New Millennium" he highlights that:

Only 26% of CEO's in the top 1000 companies had their first degrees in Engineering (more in foreign countries);

Only 10% of university presidents are engineers;

Few engineers are in Congress; and that

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President Jimmy Carter, who was an engineer president, (quite contrary to the emerging trend of the recent U.S. history) did not get reelected.

Dr. Chang then quite delicately asks :

Is the engineering mindset and attitude not compatible with management work?

Is the education preventing engineers from becoming great leaders?

Are the strengths in engineering have become weaknesses in management?

Are there some distinctions in the work done by the engineers and that by the managers?

In particular reference with the last of the above narrated aspects let's now move on to see for our concluding lines the required traits of leaderships, which should be our actual focus and which an engineer should eventually be able to gather, provided those of being a good engineer and a good managers have been acquired:

Managers – set goals, plan actions, secure resources, set up structures, exercise control and secure results;

Leaders – set vision/direction, create strategies, conceive actions, align/motivate people and form coalitions.

Conjunct with the work of Dr. Chang, it would be befitting to quote that National Academy of Engineering, Washington D.C., has Published a Phase 1 Report, under the caption of “The Engineer of 2020”, in which eleven “Attributes of Engineers of 2020” have been placed. These include:

- i. Strong Analytical Skills,
- ii. Practical Ingenuity,
- iii. Creativity,
- iv. Communication,
- v. Business & Management,
- vi. Leadership,
- vii. High Ethical Standards,
- viii. Professionalism,
- ix. Dynamism,
- x. Agility, Resilience, and Flexibility,
- xi. Life-long Learning

These attributes, with the order of top on top, have been grounded by Dr. Chang into 4 major categories:

- i. Leadership (high ethical standards, professionalism, communication)

- ii. Technical Capabilities (strong analytical skills, practical ingenuity, creativity)
- iii. Business and Management
- iv. Drive to Excel (dynamism, agility, flexibility, life-long learning)

It could be noticed that the above exactly coincides with our discussion as undertaken in the preceding sections, with all the essentials appearing to be so much adjoined.

Now at this concluding juncture one may finally like to ask that with the course of pattern all set for transition from a good engineer to a good manager and eventually to be a good leader, is there any other element which has been left out? The answer quite astonishingly brings us back to the start of our discussion – i.e., an engineer - apt to take this role; rest is pretty much bound to come. A wandering habitué, even with the thrust in baffle, would then be the one to trigger and spark.

9. CONCLUSION

We conclude with the submission that for an effective, contributive and visionary role, engineers are much required to understand the path to be the managers first and the leaders eventually - with too simple but raising traits as noted above - and with too simple and adaptable traits as condensed below:

“Rules of Thumb” from experience are worth knowing;

Constantly reading to reinforce one’s conviction in the values of noted managerial and leadership profiles; and

Practicing them until the preferred behavior becomes ones’ second nature.

Public policy, and finally the social success would certainly be having new dimensions of accomplishment if this little corollary is understood by the engineers.

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