

## **Generation Y and work values: are they really that different? A cross-national examination using data mining of Twitter**

Increased life expectancies and initiatives to retain older workers for a longer time period means that the workforce is becoming more age-diverse. This, alongside increased competition for the smaller proportion of younger individuals entering the workforce, has led to increased interest in the attitudes and preferences of different age groups or generations. In particular, employers need to develop a clear understanding of the work values and behaviors of one of the youngest generations in the workforce (generation Y) and how they might differ from previous generations in order to effectively attract and manage this new cohort of employees, (Twenge and Campbell, 2008).

Despite this interest, empirical evidence for generational differences in work values is mixed and inconclusive (Parry 2014), with scholars failing to agree on the nature and characteristics of generational cohorts and some not finding generational differences at all (Parry and Urwin, 2011). In addition, several concerns have been raised over the methodological rigor associated with studies of generational diversity and with the large amount of heterogeneity within generational cohorts.

One of the major concerns with regard to the evidence for generational differences is the fact that the extant literature has largely ignored national context and assumed that generational cohorts and their attitudes are the same regardless of location. This is despite extensive research on national culture, which has demonstrated that national context drives values and work behavior (e.g. Adler, 1991; Peretz et al, 2015, Peretz and Fried, 2012). In addition, theoretically, as generational theory suggests that values develop as a result of the formative experiences of individuals, it would seem unlikely that those growing up in different contexts would have the same experiences, or therefore values.

Despite support for the significant effect of national context, most of the studies regarding generational differences have been conducted in Western (mostly US) contexts (Parry and Urwin, 2011). We suggest that research on generations in the USA cannot simply be mapped onto those in other countries or cultures (Parry and Urwin, 2011). The purpose of this study was to compare generational characteristics across countries. We suggest that employees from different birth cohorts from different countries will have different characteristics, therefore making the process of ascribing

work values to particular generations within multi-national groups difficult. Therefore, in this study we explore the following research question: *How do generational differences (in work values and work behavior) differ across different national contexts?*

### ***Method***

In order to empirically examine the research question, a novel strategy was used: data mining of online social network. Unlike traditional surveys, that naturally are limited by number of participants, and hence can be biased, data mining of the big data available via social networks enable us to extract insights from billions of public social conversations and posts on online social networks (while protecting the identity of individuals by aggregating and anonymizing results), and as a result, the insights received will be much more reliable.

### ***Sample***

We concentrate on four distinct countries in order to obtain the maximum variation in relation to national context: *USA, Russia, India* and *Argentina*.

We conduct web analysis on Tweeter social network web. The final amount of data (see the procedure section) that we analyzed was 1,860,000 Tweets.

### ***Procedure***

First, data was gathered and extracted using Tweepy software and then filtered to focus on work-related data. A vocabulary of work-related values was created that included synonymous and slang for each work-related value in each language. Cluster analysis and Ngrams distribution analysis was then used to create generational groups in each country and sentiment analysis was used to determine if the tone towards the value was positive or negative. The distribution of each value in each cluster (positive and negative) was then established and analyses were undertaken to determine if the distribution between clusters differed significantly.

### ***Results***

We found differences between Millennials and Generation X in the USA but in Russia, Argentina and India, the pattern of work values of all generations was the same. We also found that the values of the younger generations in the four countries were not the same as each other. For example, in the USA Millennials valued advancement and change and Generation X valued balance and stability. In India all generations valued fairness and contribution to society, and in Argentina teamwork and friendships were important. These differences were significant ( $F=7.80$ ,  $p<.01$ ), with post hoc analysis

indicating that the major difference was between USA and India and between USA and Russia. We did not find any significant differences between generations ( $F=.89$ ;  $p>.05$ ) when looking at generations among the four countries together.

### **Conclusion**

Our results suggest that reality of generational differences is more complex than previous researchers and scholars have argued, and that the Western notion of generational differences is not valid everywhere. In the US, we found differences between age groups equating to generation X and Millennials, but this was not true in India, Argentina or Russia, suggesting that a global approach to generational diversity is not appropriate. The fact that generational differences were found only in the US and not in the other three countries demonstrate that generations in the US have formed in response to American' historical landmarks such as Kennedy's assassination and the Vietnam War – events that are unlikely to have had as great an impact outside the US. Finally, the study provides support for the contingency approach (e.g Rousseau & Fried, 2001). The contingency approach, also known as the situational approach, is a concept in management stating that there is no one universally applicable set of management principles by which to manage organizations. Organizations are individually different, face different situations (contingency variables), and require different ways of managing. As our study indicates, one key variable is the work values of employees in different contexts (country and generation). In the future, we clearly need more research from additional countries in order to reach valid conclusions about this phenomenon of generational differences across national contexts.

### **References**

- Adler, N. (1991), *International Dimensions of Organizational Behavior*, 2nd ed., PWS-Kent, Boston
- Parry E. (2014). New Perspectives in researching generational diversity: an introduction. In Parry E. (Ed). *Generational Diversity at Work: New Perspectives*. London, Routledge.
- Parry, E. & Urwin, P. (2011). Generational Differences in Work Values: A Review of Theory and evidence, *International Journal of Management Reviews*, 13, 79–96

- Peretz, H. Levi, A. & Fried, Y. (2015). Organizational diversity programs across cultures: Effects on absenteeism, turnover, and performance. *International Journal of Human Resource Management*, 26(6), 875-903.
- Peretz, H. & Fried, Y. (2012). National cultures, performance appraisal practices, and organizational absenteeism and turnover: A study across 21 countries. *Journal of Applied Psychology*, 97, 448-459.
- Rousseau, D.M., & Fried, Y. (2001). Location, location, location: Contextualizing organizational research. *Journal of Organizational Behavior*, 22, 1-13.
- Twenge, J. M., & Campbell, S. M. (2008). Generational differences in psychological traits and their impact on the workplace. *Journal of Managerial Psychology*, 23, 862–877.

## **The advantage of having an honest reputation:**

### **The “Big Two” agency and communion dimensions in negotiations**

“Negotiation has been an important area of research within organizational behavior and management science for the past 50 years” (Brett & Thompson, 2016, p. 68). In the present research we focus on reputations, which have been found to significantly impact the negotiation process and outcomes (Tinsley, Cambria, & Schneider, 2008). Given that we often negotiate with unfamiliar people with whom we have limited or no prior acquaintance, following rather secondhand, general and brief information about them (Glick & Croson, 2001), it is important to gain insight into the role of various reputations and to acknowledge their distinct impact on negotiations. In particular, when we have limited previous experience with the other party, receiving information about her seemingly "good" or "bad" (Osgood, Suci, & Tannenbaum, 1957) reputation serves a starting point for making assumptions about her intentions, and for developing expectations about her future behavior (Nisbett & Ross, 1991). These expectations in turn may have a central role in guiding negotiators' behavior towards their counterparts (e.g., Bandura, 1977; Mischel, 1973).

Prior research primarily focuses on examining the role of cooperative vs. competitive reputations (e.g., Diekmann, Tenbrunsel, & Galinsky, 2003; Tinsley, O'Connor, & Sullivan, 2002). The current research expands the array of reputation types examined. Building upon research on the "Big Two" (Abele & Wojciszke, 2013) fundamental dimensions of social judgment – agency (or the ability-competence dimension) and communion (or the social-moral dimension), we examine competent (a trait belonging to the agency dimension) vs. friendly (a trait belonging to the social dimension) vs. honest (a trait belonging to the moral dimension) reputations and explore their distinct impact across both distributive and integrative negotiation settings.

Unlike competitive reputations, receiving prior information that one's counterpart is a competent and skilled negotiator provides negotiators with information that their counterpart has the ability to carry out his or her intentions (Fiske, Cuddy, & Glick, 2007). Yet, such a reputation fails to provide information regarding intentions—whether this counterpart intends to compete or cooperate.

Likewise, although counterparts with friendly or honest reputations are intuitively expected to be cooperative and to have pro-social intentions (Fiske et al., 2007), we offer that they may have distinct influences in negotiations. This notion is in line with previous work on the “Big Two”, suggesting that morality and sociability are conceptually distinct components of the communion dimension and play different roles at the group (e.g., Leach, Ellemers, and Barreto, 2007) and individual (e.g., Anderson & Sedikides, 1991) levels. Moreover, given that honesty represents a particularly important concern in negotiations (Lewicki, Barry, Saunders & Minton, 2003), gaining insight into the understudied distinct role of having an honest (vs. friendly) reputation in negotiations is important.

In four studies we explore the distinctive and primary role of being perceived as honest vs. friendly or competent, in negotiations: In Study 1, participants received a set of positive traits and indicated the extent to which it is important for negotiators to be perceived by counterparts as possessing each trait. We found that negotiators desire to be perceived by their counterparts for and foremost as honest, next as competent and least, as friendly. Consistent with such preferences, results confirm the advantage of having an honest reputation.

In Study 2, participants imagined being a buyer of a car, about to negotiate the final price with a seller with one of four reputations: “honest, sincere, & trustworthy”, “friendly, likeable, & warm”, “intelligent, competent, & skilled”, or control/no-reputation (manipulated between-subjects). They then reported their expectations, trust (ability-, benevolence-, and integrity-based trust, Mayer & Davis, 1999), and unethical behavioral tendencies towards that counterpart (using the Self-Reported Inappropriate Negotiation Strategies scale; SINS, Moran & Schweitzer, 2008; Robinson, Lewicki, & Donahue, 2000). Results show that although presumably honest and friendly counterparts were expected to be equally more pro-social than presumably competent ones, those with honest reputations were higher (than friendly) in perceived professionalism, reliability and fairness. Similarly, while competent reputations induced ability-based trust and friendly reputations induced benevolence- and integrity-based trust, honest reputations induced all three types of trust

(ability, benevolence, and integrity) concurrently, and decreased the likelihood of being deceived (an effect mediated by the high integrity-based trust).

In Study 3, we extended our examination to actual negotiation decisions. Participants engaged in the same distributive negotiation as in Study 2, with a pre-programmed “seller” with varying reputations. We found that participants proposed less selfish first offers to honest than to friendly (or competent) sellers. They also reported less negative emotions after receiving an *identical pre-programmed highly competitive* counter-offer from an honest (versus friendly) seller, and responded by offering more money to honest than to friendly (or competent) sellers.

In Study 4 we replicated the advantage of honest versus friendly reputations in a multi-issue variable-sum (integrative) negotiation. Negotiators offered more value-creating offers (increasing joint pie) when negotiating with presumably honest compared to friendly counterparts and evaluated their presumably honest (compared to friendly) counterparts as acting in a greater pro-social manner even when their offers (and messages) were pre-programmed and held fixed across conditions.

The current research demonstrates that even in the absence of expectations for repeated interactions, negotiations should be concerned about their reputations. Working towards creating and maintaining an honest reputation has value even within a single, one-shot negotiation interaction.

Overall, building on research on the big-two dimensions in social judgments, this work illuminates on various reputations in the negotiation domain and demonstrates their distinct effects on negotiators’ judgements and decisions. Practically, negotiators are often concerned about increasing negotiation outcomes (self and joint), and decreasing the likelihood of being deceived. Our research implies that developing an honest (rather than friendly or competent) reputation may be most beneficial.

## References

- Abele, A. E., & Wojciszke, B. (2013). The Big Two in social judgment and behavior. *Social Psychology, 44*, 61–62.
- Anderson, C.A., & Sedikides, C. (1991). Thinking about people: Contributions of a typological alternative to associatonistic and dimensional models of person perception. *Journal of Personality and Social Psychology, 60*, 203–217.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–215.
- Brett, J., & Thompson, L. (2016). Negotiation. *Organizational Behavior and Human Decision Processes, 136*, 68–79.
- Diekmann, K. A., Tenbrunsel, A. E., & Galinsky, A. D. (2003). From self-prediction to self-defeat: Behavioral forecasting, self-fulfilling prophecies, and the effect of competitive expectations. *Journal of Personality and Social Psychology, 85*, 672–683.
- Fiske, S. T., Cuddy, A. J., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in cognitive sciences, 11*, 77–83.
- Glick, S., & Croson, R. (2001). Reputations in negotiation. In S. Hoch & H. Kunreuther (Eds.), *Wharton on making decisions* (pp. 177–186). New York: John Wiley.
- Leach, C. W., Ellemers, N., & Barreto, M. (2007). Group virtue: The importance of morality (vs. competence and sociability) in the positive evaluation of in-groups. *Journal of Personality and Social Psychology, 93*, 234–249.
- Lewicki, R., Barry, B., Saunders, D., & Minton, J. (2003). *Negotiation* (Eds.). Boston: McGraw-Hill/Irwin.
- Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of management review, 20*, 709–734.
- Mischel, W. (1973). Toward a cognitive social learning reconceptualization of personality. *Psychological Review, 80*, 252–283.



Moran, S., & Schweitzer, M.E. (2008). When better is worse: Envy and the use of deception.

*Negotiation and Conflict Management Research, 1*, 3–29.

Nisbett, R., & Ross, L. (1991). *The person and the situation*. New York: McGraw Hill.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1957). *The measurement of meaning*. Urbana, IL:

University of Illinois Press.

Robinson, R. J., Lewicki, R. J., & Donahue, E. M. (2000). Extending and testing a five-factor model

of ethical and unethical bargaining tactics: Introducing the SINS scale. *Journal of*

*Organizational Behavior, 21*, 649–664.

Tinsley, C. H., Cambria, J., & Schneider, A. K. (2008). Reputations in negotiation. In A. K.

Schneider, & C. Honeyman (Eds.), *The Negotiator's Fieldbook: The Desk Reference for The*

*Experienced Negotiator*. Marquette Law School Legal Studies Paper No. 08-08.

Tinsley, C. H., O'Connor, K. M., & Sullivan, B. A. (2002). Tough guys finish last: The perils of a

distributive reputation. *Organizational Behavior and Human Decision Processes, 88*, 621-

642.

*Mid-level Managers in multi-national hi-tech organizations as Constructors of Value and Worth*

This paper examines how mid-level managers in multi-national hi-tech organizations, who operate in a complex, multi-dimensional global working environment, deal with the challenge of long-distance management, and examines their strategies and practices. This grounded-theory-approach research suggests that these managers, due to their unique position in the intersection of management and operations (Dutton et al., 2001; Huy, 2002; Wooldridge et al., 2008), constitute social agents with a significant role in the process of social construction and formation of measures of value and worth in their organizations. In this manner, mid-level managers have a key role in providing the required supportive organizational environment that enables creativity and innovation.

The theoretical model proposed here is based on an empirical examination of forty in-depth interviews conducted with mid-level managers from ten different multi-national hi-tech organizations. The analysis of the findings, based on the constructivist paradigm (Shlasky & Alpert, 2007; Shlasky & Ariel, 2016; Schutz, 1967) and Anthony Giddens' theory of structuration (Giddens, 1984), indicates a dialectical process in which the managers' practices shape the social field in which they are operating (the organization) and at the same time are shaped by it. This dual process is manifested in the process of employee evaluation, which implements two main mechanisms of long-distance management and control: the normative mechanism, which aids in managing cultural and behavioral aspects (Kunda, 2000), and the accounting mechanism, which produces professional and operations unification through numerical representation (Robson, 1992).

Thus, the findings indicate that mid-level managers cope with the challenges of long-distance management by setting behavioral norms and assigning clear worth to outcomes and products. Although they operate within a set of values and rules determined by the organization and decided upon by senior management, by translating and implementing the organization's strategic decisions, the mid-level managers affect the way they are shaped. Therefore, mid-level managers at one and the same time shape and are shaped by the social field in which they operate. They are required to produce clarity for the actors operating in an ambiguous and dynamic organization and this requirement leaves them room for interpretation, which turns them into an integral part of institutional action frame.

This manner of conduct is clearly reflected in one of the most common and frequent processes in multi-national hi-tech organizations: performance management (Mercer Talent, 2013). This process is at the core of the construction of value and worth in the organization, as it measures and rewards behavioral and performative aspects. Through this process, managers clearly define to their subordinates, and even to their colleagues, the desirable and undesirable behaviors and the worth of the outcomes of their work. The findings indicate a gap between the organizations' guiding framework, which is determined by senior management, and its implementation in actual practice by mid-level managers. The organization indeed outlines a structured process and indicates the general values to be rewarded and appreciated, but the managers who implement the process endow it with additional layers of meaning that define, in fact, the framework of reference of those operating in the organization. This gap testifies to the leeway and room for interpretation that mid-level managers have and enables them to bestow a renewed meaning upon organizational values and thereby reshape them. That is to say, mid-level managers redefine and reshape the decisions made by senior management. Thus, mid-level managers, by constructing value and worth, also marks the boundaries within which behaviors such as innovation, creativity and entrepreneurship in the organization are actually allowed.

Furthermore, the findings suggest that mid-level managers not only contribute to the reshaping of the organization's framework for action but also preserve it. Due to the internalization resulting from numerical representation and normative control mechanisms, mid-level managers assent and justify the behavioral norms and guidelines defined by senior management. In this sense, the middle echelon simultaneously preserves the status of senior leadership in the organization and shapes its activity. This, through accepting its authority and interpreting the values it outlines and their worth.

Exposing the dialectical principle that organizes the long-distance management mechanisms in multi-national organizations, through this focused empirical examination of mid-level managers in multi-national hi-tech organizations and their mechanisms for coping with their work environment - may contribute to the theoretical discourse of international management and the unique position of mid-level managers.

By indicating the mid-level crucial part in determining the value and worth of the day-to-day activity, the research findings strengthen and complement studies that point to the significant influence mid-level managers has over strategic process within the organization, such as: leading entrepreneurial activity in the organization (Dutton et al, 2001), improving the quality of the decisions making process and its implementation, as well as cognitive and emotional significance given to decisions by members of the organization during organizational changes (Huy, 2002; Rouleau, 2005).

## References

- Dutton, J. E., Ashford, S. J., O'Neill, R. M., & Lawrence, K. A. (2001). Moves that matter: Issue selling and organizational change. *Academy of Management Journal*, 44(4), 716-736.
- Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Univ of California Press.
- Huy, Q. N. (2002). Emotional Balancing of Organizational Continuity and Radical Change: The Contribution of Middle Managers. *Administrative Science Quarterly*, 47(1), 31–69. <http://doi.org/10.2307/3094890>
- Mercer Talent. (2013). 2013 Global Performance Management Survey Report. <https://www.mercer.com/content/dam/mercer/attachments/global/Talent/Assess-BrochurePerfMgmt.pdf>
- Robson, K. (1992). Accounting numbers as “inscription”: Action at a distance and the development of accounting. *Accounting, Organizations and Society*, 17(7), 685–708. [http://doi.org/10.1016/0361-3682\(92\)90019-O](http://doi.org/10.1016/0361-3682(92)90019-O)
- Rouleau, L. (2005). Micro-practices of strategic sensemaking and sensegiving: How middle managers interpret and sell change every day. *Journal of Management studies*, 42(7), 1413-1441.
- Schutz, A. (1976). Collected papers: Studies in social theory (Vol. II). *The Hague, Martinus Nijhoff*.
- Wooldridge, B., Schmid, T., & Floyd, S. W. (2008). *The Middle Management Perspective on Strategy Process: Contributions, Synthesis, and Future Research*. *Journal of Management* (Vol. 34). <http://doi.org/10.1177/0149206308324326>
- ### Hebrew Publications
- Kunda, G. (2000). *Engineering culture: Control and dedication in a hi-tech company*. Tel-Aviv: Hargol.
- Shlasky S., & Alpert B. (2007). *Ways of writing qualitative research: From deconstructing reality to its construction as a text*. Mofet Institute.
- Shlasky, S., & Arieli, B. (2016). From positivism to hermeneutics and postmodern approaches in education research. In: *Traditions and genres in qualitative research: Philosophies, strategies, and advanced tools*, Ed: Naama Sabar-Ben Yehoshua. Mofet Institute.

## **Holonic approach to management of construction enterprises**

Abstract - This paper investigates the potential of an innovative approach to management within construction organizations entitled holonic management. Construction projects have become much more complex and current project management tools are inadequate. Technological advances and the greater involvement of human factors contribute to this complexity. Holonic management is a combination of top-down and bottom-up management and takes advantage of the conflict and contradiction arising from the tension between these two approaches. Its application to complex projects in the construction industry is explored using tools of systems thinking and system dynamics. The paper analyzes three types of management using system dynamics diagrams. A case study based on the Adelaide Desalination Plant demonstrates the use of this new approach and reveals lessons learned and best practice ideas. This approach has clear potential for application to management within the construction industry in the context of greatly increasing project complexity, and could result in enhanced efficiency and effectiveness.

Keywords: complex construction projects, bottom-up management, top-down management, holonic management, system dynamics.

### **INTRODUCTION**

Comprehensive management skills are needed more than ever given our current times of unprecedented change. Management involves coordinating and overseeing the work activities of others towards the achievement of organizational goals with efficiency and effectiveness Robbins, Bergman, Stagg, and Coulter (2009). Management can be defined as; “The capacity to create a work environment with such a way that each person is uniquely motivated to achieve the organizational goals, and feels recognized for so doing” (Carlopio & Andrewartha, 2011, p. 17).

Levels of uncertainty, complexity, change and paradox are increasing rapidly (Holmberg, Larsson, & Bäckström, 2016). All of this calls for high levels of management skills. As Shenhar & Dvir (2007, p.7) commented: “Most project problems are not technical but managerial”. Contemporary management skills are about soft skills as much as hard skills; Daft and Marcic (2014, p. 11) assert that soft skills can account for at least 80% of job success, while only about 15% is due to technical skills and functional expertise.

One basic categorization of management styles is that of either top-down or bottom-up. These linear approaches can also be called authoritarian and democratic/participative respectively; for example, Gomberg (1985), Lussier and Achua (2013). For simple projects, a top-down centralized approach may be suitable with its standardized work process using rules and procedures, backed by monitoring of compliance and sanctions for noncompliance. For more complicated projects, bottom-up or democratic approaches involving greater input and participation by workers into planning and methods will be more appropriate and effective. However, this paper asserts that there is a need for a creative approach to deal with current complexities in construction which is neither top-down nor bottom-up, but more flexible and more responsive to minute by minute changing circumstances.

There is a growing awareness that our knowledge and usage of appropriate management tools is inadequate for our current circumstances (Gorod, Sauser, & Boardman, 2008; Lord & Hall, 2005; Mumford, Campion, & Morgeson, 2007). Several authors, for example, Haupt (2003), have commented upon the preponderance of a top-down style within construction. However Kasapoğlu (2014) investigated the preferences of Turkish architects for more basic autocratic management or more democratic and relationship oriented management within the context of team leadership/management styles and found that there was a preference for relationship oriented styles. In a survey on leadership for mega projects, Toor and Ogunlana (2008) observed that the attributes of relational leaders were rated highly by various construction

stakeholders as compared to those of more basic leaders who managed at a transactional level. They also observed that the use of authority and punishment were rated among the least popular and effective of leadership behaviours. In addition, Hartmann (2006) investigated critical issues in the relationship between organizational culture and innovation processes in construction. The author emphasized the role of organizational culture in motivating innovative behaviour and suggested a number of managerial actions including autonomy, communication instruments, job feedback to improve the management outcome.

This paper is concerned with proposing a creative approach to management within construction organizations which should allow for better outcomes, given the complexity of the environment. The new approach proposed herein takes an all-encompassing view of construction management. It is qualitatively different from the hierarchical top-down view in which manageability is high but flexibility is low. The approach is also different from the now well understood bottom-up view which is high on flexibility but lacks controlling ability. It is similar in nature to the leaderless organization concept arising from the growth in decentralized organizations. The approach is analogous to the differences between a spider (centralized organization) and a starfish (a decentralized organization which can regenerate); Brafman and Beckstrom (Brafman & Beckstrom, 2006). There is a sweet spot somewhere between these two extremes which contains the optimal proportion of decentralized and centralized features, and that is the nature of the approach to construction management which is the subject of this paper.

## **BACKGROUND INFORMATION**

### **Construction projects have become more complex**

The construction sector is considered one of the 3-D industries (difficult, dirty, and dangerous) (Kim, Kim, Shin, & Kim, 2015, p. 85). Unpredictable problems can occur and there will therefore be a need for creativity and innovation in problem solving (Limsila & Ogunlana, 2008). There may be different levels of confidence and optimism within each project, and there are many pressures arising from the environment of uncertainty. This is not an easy environment in which to work. The construction industry presents significant and unique challenges for management with characteristics that separate it from other industries, including project characteristics, contractual arrangements, project lifecycle, and environmental factors. Clearly such complicated and complex undertakings require sophisticated management as well as high-level technical skills, and it is management which is the focus of this paper. It is increasingly common to differentiate project contexts as a hierarchy of simple, complicated, complex and finally chaotic (Bakhshi, Ireland, & Corral De Zubielqui, 2015). Simple projects have clear cause and effect relationships. Participants can access the information they need. Complicated projects contain cause-and-effect relationships but these are disputed. Complex projects contain high degrees of ambiguity and uncertainty. Chaotic projects are not manageable but must be brought back to the complex level.

Of course, not all construction projects are complex. In simple construction projects, traditional command-and-control or top-down management will be suitable. In the case of more complicated projects, bottom-up management with the injection of views and knowledge from across the organization will be appropriate. However complex projects will require governance whereby the managers and the governing board influence the environment indirectly. Due to the increasing complexity of construction projects arising from technological advances and the greater involvement of human factors, current tools to manage such projects are unsuitable and not sufficiently sophisticated: there are no frameworks allowing complex construction projects to be managed differently.

Traditional project management has tended to view projects as ordered, simple and predictable phenomena, consisting of discrete elements. The sequential order process lends itself to linear planning and execution. Thus traditional project management is applied top down, via

“management-as-planning” (Koskela & Howell, 2002). However some authors, for example, DeCarlo (2004), have noted that traditional project management can no longer cope with current realities: technological advances mean that project management also needs to advance. Previously used linear methods, rigid timelines and strict process requirements are not flexible enough to adapt to our constantly changing environment. Project requirements can change daily, and teams are expected to handle those changes fluidly. Stakeholders want more involvement with projects at all stages during the process, which means that they want continuing input at any time. Constant newsfeed also influences people’s perceptions of the external environment. De Meyer, Loch, and Pich (2002) investigated ways to manage project uncertainty and note that managers often failed to recognize the different types of uncertainty which can arise and the different management approaches necessary. They classify uncertainty in terms of variation, foreseen uncertainty, unforeseen uncertainty which cannot be identified during planning and chaos wherein projects are uncertain right from the start and the final results can be completely different from the original plan. Each of these four types of uncertainty requires management strategies. In particular, managing unforeseen uncertainty means that the plan must evolve as time goes by and emerging influences need to be recognized. Identifying potential problems early is important. As these authors point out, many projects contain a blend of these types of uncertainty.

When we turn to project management in the construction industry, this now presents significant and unique challenges for leaders, given the recent growth in size and complexity of large-scale infrastructure projects. Projects tend to be huge in scale and investment requirements, temporary in nature but spanning over a lengthy time period, and involving a large number of stakeholders, both internal and external. Complexity is enhanced due to the many features associated with the nature of such projects: not only scale but also complex system structures requiring a wide range of expertise in various knowledge domains, the widespread use of subcontractors, and the need to operate in a dynamic environment (Lin, Qi, & Du, 2008). Thus communication and coordination issues arise and there is a high level of risk. Many jobs are project-based.

Construction projects are generally divided into parts and these will be subcontracted out to individual companies/specialists. Thus the industry is highly fragmented and firms cooperate in differing patterns, with selection for a project decided mainly by the lowest bid. Projects are also interwoven with each other, as firms participate in more than one project at the same time, utilizing the same production capacity (Bertelsen, 2003). The project and the construction site is also a work place for people and is therefore a place for cooperation and social interaction, and perhaps conflict. Given a project’s temporary nature, the social system resulting is highly transient. Thus the workers at the construction site may not be hired and paid by that site; and they may experience divided loyalty between the firm which hired them and their current job, often with their own original firm given top priority. Traditional project management tends to ignore this fact.

According to Baccharini (1996), the importance of complexity to project management processes was widely acknowledged, even at that time, including the fact that complexity makes the clear identification of goals/objectives more difficult, it is an important criteria in selecting an appropriate organizational form, it influences the choice of project inputs and of suitable procurement arrangements, and it adds to time, cost and quality. In summary, complexity must be taken into account in determining planning, coordination and control requirements. This paper, then, proposes an innovative method for managing complex projects which combines top-down and bottom-up management. The new approach, holonic management, is analysed in terms of the Adelaide Desalination Plant case study. This analysis indicates the usefulness of holonic management within the complex construction industry.